FIELD MUSEUM OF NATURAL HISTORY BULLETIN

January 1988

"Mothers and Daughters"

Exhibition of 128 Photographs

Opens January 27

SHOUT
SHARE
IT

Field Museum of Natural History Bulletin

Published since 1930 by
Field Museum of Natural History
Founded 1893

Editor/Designer: David M. Walsten
Production Liaison: Pamela Stearns
Staff Photographer: Ron Testa

BOARD OF TRUSTEES

Richard M. Jones, *Chairman*
Mrs. T. Stanton Armour
George R. Baker
Robert O. Bass
Gordon Bent
Mrs. Philip D. Block III
Willard L. Boyd, *President*
Robert D. Cadieux
Henry T. Chandler
Worley H. Clark
Frank W. Considine
Stanton R. Cook
William R. Dickinson, Jr.
Thomas E. Donnelley II
Thomas J. Eyerman
Marshall Field
Ronald J. Gidwitz
Clarence E. Johnson
John James Kinsella
Hugo J. Melvoin
Leo F. Mullin
James J. O'Connor
Robert A. Pritzker
James H. Ransom
John S. Runnells
Patrick G. Ryan
William L. Searle
Mrs. Malcolm N. Smith
Robert H. Strotz
Mrs. Theodore D. Tieken
E. Leland Webber
Blaine J. Yarrington

LIFE TRUSTEES

Harry O. Bercher
Bowen Blair
Mrs. Edwin J. DeCosta
Mrs. David W. Grainger
Clifford C. Gregg
Mrs. Robert S. Hartman
Edward Byron Smith
John W. Sullivan
J. Howard Wood

CONTENTS

January 1988
Volume 59, Number 1

JANUARY EVENTS AT FIELD MUSEUM 3

UNEARTHING ANCIENT AMPHIBIANS
The oldest known tetrapods in North America find a home in the collections of Field Museum, by Robert McKay 6

PARADISE BEING LOST
A bittersweet expedition to the Brazilian Amazon, by John W. Fitzpatrick, Chairman of the Department of Zoology 10

A CELEBRATION OF PHILIP HERSHKOVITZ,
Emeritus Curator of Mammals, by Bruce D. Patterson, Associate Curator of Mammals and Head, Division of Mammals 24

STUDIES IN NEOTROPICAL MAMMALOGY,
Essays in Honor of Philip Hershkovitz, a list of contents 30

FIELD MUSEUM TOURS 31

COVER PHOTO
"Mothers and Daughters": exhibit of 128 photographs opening in Gallery 9 on January 27 and closing March 13. Photo by Roland L. Freeman of Nellie G. Morgan and Tammie Pruitt Morgan at the Bicentennial, July 4, 1986, in Philadelphia, Miss. From a 20 × 16 silver gelatin print on view in the exhibition.

Field Museum of Natural History Bulletin (USPS 898-940) is published monthly, except combined July/August issue, by Field Museum of Natural History, Roosevelt Road at Lake Shore Drive, Chicago, IL 60605-2496.

Copyright ©1988 Field Museum of Natural History.

Subscriptions: $6.00 annually. $3.00 for schools. Museum membership includes *Bulletin* subscription. Opinions expressed by authors are their own and do not necessarily reflect the policy of Field Museum. Unsolicited manuscripts are welcome. Museum phone: (312) 922-9410. Notification of address change should include address label and be sent to Membership Department. Postmaster: Please send form 3579 to Field Museum of Natural History, Roosevelt Road at Lake Shore Drive, Chicago, IL 60605-2496. ISSN: 0015-0703. Second class postage paid at Chicago, Illinois

EVENTS

Kodo: Drummers of Japan

Friday, January 22, 8:00pm
Saturday, January 23, 2:00pm

SINCE ANCIENT TIMES the beaten drum has served as a means of communication among people. In times of joy, grief, fun, and in boiling rage, people have sung and danced to the beat of the drum.

KODO—the word has two meanings—heartbeat and "children of the drum." In Japan, a group of young people call themselves Kodo and are dedicated to a spartan lifestyle and the art of Japanese drumming. Founded in 1971 by Tagayasu Den, a Japanese scholar, this twelve-person group has enthralled audiences the world over with this spectacular drumming tradition.

Kodo live and work on the small island of Sado, 200 miles northwest of Tokyo, in the Sea of Japan. They have gained worldwide recognition for their dedication to a rigorous and austere lifestyle and for their mastery of ancient Japanese instruments—most notably the *o-daiko,* a huge drum *(taiko)* that can weigh close to 1,000 pounds and is played with sticks the size of small logs. According to Japanese legend, gods and goddesses reside within the o-daiko, and the drummers "fight the drum" until they come out. The 15-year-old Kodo ensemble is considered among the very best in a country famous for its drummers.

Kodo's music has been described as having the "natural strength and violence of a hurricane." Kodo came to be in 1971, when Tagayasu Den, a scholar of the traditional Japanese arts, gathered a handful of young men and women on Sado and taught them how to play the o-daiko. Within four years the group, then known as *Ondekoza,* or "demon drummers," was performing in public. Their American debut occurred in 1975, immediately after each member had completed the Boston marathon. Join us now for their first Chicago visit.

Tickets: $14.00 ($12.00 members)

P88101 Friday, January 22, 8:00pm
P88102 Saturday, January 23, 2:00pm

Tickets are limited and advance ticket purchase is necessary. Seating is general admission. Theatre doors open one hour prior to performance.

Continued ▷

EVENTS

Susumu Yoshida

Kodo: Drummers of Japan

January 22 and 23

Registration

Be sure to complete all requested information on this ticket application. If your request is received less than one week before the program, tickets will be held in your name at the West Entrance box office. Please make checks payble to Field Museum. Tickets will be mailed upon receipt of check. Refunds will be made only if the program is sold out.

☐ Member ☐ Nonmember

American Express/Visa/MasterCard

Card Number

Signature Expiration Date

Name

Address

City State Zip

Telephone: Daytime Evening

Program	#Member Tickets ($12.00 ea.)	#Nonmember Tickets ($14.00 ea.)	Total Tickets	Amount Enclosed
"Drummers of Japan" P88101, Jan. 22				
"Drummers of Japan" P88102, Jan. 23				
			Total	

☐ Scholarship requested

Return complete ticket application with a self-addressed stamped envelope to:

Field Museum of Natural History
Public Programs: Department of Education
Roosevelt Road at Lake Shore Drive
Chicago, IL 60605-2497

EVENTS

World Music Program

Weekends in January
1:00pm and 3:00pm

JOIN Us for live musical demonstrations and informal discussion with the artists.

January 2	1:00pm and 3:00pm–*Raices del Ande,* playing lively folk music of the Andes.
January 3	1:00pm and 3:00pm–*Librado Salazar,* plays classical guitar.
January 9, 10	1:00–*Gideon Alorwoyie,* presents the dance and drums of Ghana. 3:00pm–*Chicago Beaux,* and his blues harmonica.
January 16, 17	1:00pm–*Shanta* tells delightful African folktales and stories. 3:00pm–*Light Henry Huff* plays the harp.
January 23, 24	1:00pm and 3:00pm–*Don Pate* plays jazz bass.
January 30, 31	1:00pm–the *Alas Poets* present new poems. 3:00pm–*Keith Eric* presents the sights and sounds of Jamaica with songs and folktales.

Winter Fun 1988

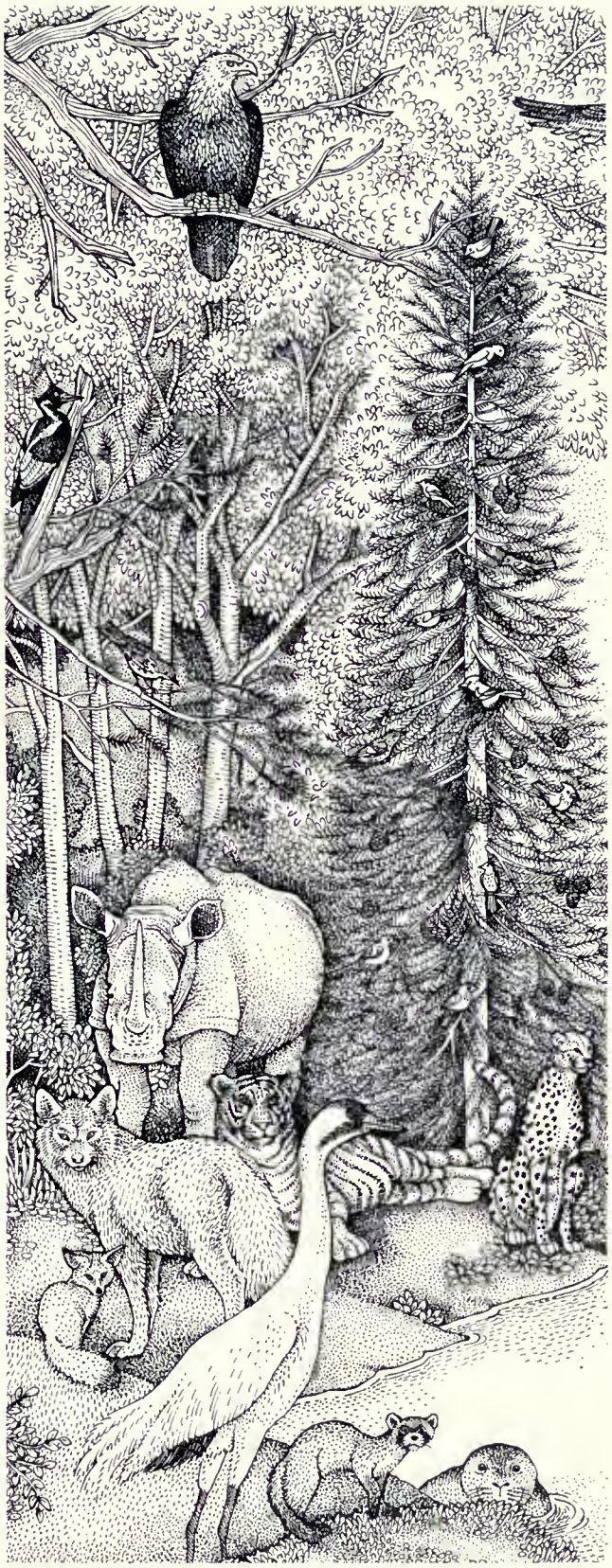
DRIVE AWAY WINTER Doldrums! Treat a child to weekend workshops at Field Museum. Workshops begin February 6-March 19. Children ages 4-13 can enjoy workshops that range in topics from Animal Humor to Fantastic Fish, Volcanoes, Medicine Wheels, and Afterlife in Acient Egypt.

A host of talented instructors bring their creative energies and expertise to this winter's workshops. Advance registration is required. See the Winter Fun brochure for a complete schedule or call (312)322-8854, Monday-Friday, 9:00am-4:00pm for further information.

Adult Programs

Register Now

MANY ADULT COURSES begin the week of February 17. Field Museum's curators are featured in a series of lectures on the South American tropics which begin on Wednesday, March 2. Another course, "Africa: A Misunderstood Continent," brings together Chicago's finest African scholars in a six-week lecture series starting Thursday, February 25. Register now for these and other adult courses. Phone registrations accepted Monday-Friday, 9:00am-4:00pm at (312)322-8855.



Patricia J. Wynne

Unearthing Ancient Amphibians

By Robert McKay

Occasionally during a geologist's routine activity, unusual or rare discoveries are made. Such was the case in the spring of 1985 when another geologist, Pat McAdams, and I visited a small, inactive limestone quarry near the town of Delta in western Keokuk County, Iowa. We discovered a layer of rock containing abundant fossil amphibian bones.

Fossils are the remains of ancient organisms, or traces of the activity of such organisms. The sedimentary rock sequence in Iowa is rich in fossils, containing literally trillions, and encountering them in the course of geologic work is quite common. The majority of these fossils are the shelly remains of invertebrates which inhabited ancient seas. Less frequently found, although not uncommon, are fossil teeth, scales, and bone from marine and terrestrial vertebrates such as fish, reptiles, and mammals. Geologists study fossils and use their findings to interpret evolutionary relationships through time, aid in correlation of rock units from place to place, and to improve our understanding of the ancient environments in which the rocks were deposited. Occasionally, geologists or amateur rock hounds discover exceedingly rare fossils which are previously unknown or which are known from only a few locations worldwide. These discoveries can greatly increase the scientific knowledge concerning the origin and evolution of certain animal groups and the environments in which they lived.

The discovery of fossil amphibian bone in Keokuk County ranks as one of the very rare fossil finds. Amphibians are the most primitive and earliest known tetrapods (four-footed animals). They represent the earliest successful attempt by vertebrate animals to migrate from the aquatic realm and colonize the land. They are also the basal stock from which all other land vertebrates, including reptiles, birds, and mammals have evolved. But the transition from fish to tetrapod, as well as the early history and subsequest diversification of early tetrapods, is poorly represented in the fossil record and thus poorly understood.

The earliest tetrapods are known from a few specimens found in Upper Devonian-age rocks (about 370 million years old) in eastern Greenland. Within the next youngest rock series, the Mississippian (360 to 320 million years old), only about 20 fossil amphibian localities are known worldwide. Most of these are in Scotland, while only six are in North America. The fossil amphibian material from the Keokuk County site is of this age and is unique because the bones are abundant and well preserved, and also because they represent the oldest known tetrapods in North America and some of the oldest known in the world.

Soon after the discovery, plans were initiated to unearth the bone bed and collect fossil specimens. The state of Iowa leased a portion of the inactive quarry, and a team of scientists was assembled for the planned excavation. John Bolt, curator of fossil amphibians and reptiles and chairman of the Department of Geology at the Field Museum, was enlisted to lead the project. With partial funding from the National Geographic Society, excavation of the bone bed began on June 10, 1986, and continued throughout the summer, ending on September 5.

The bone bed, 20 inches thick, was partially exposed in the quarry wall in the middle of a bowl-shaped limestone and shale-filled depression. A backhoe was employed early in the excavation to strip off approximately 10 feet of rock covering the bone-rich layer. Once down to the bone bed, a crew of six geologists using rock hammers, trowels, knives, brushes, and dental picks carefully uncovered and removed hundreds of specimens during the summer-long excavation. The bones were embedded in limestone conglomerate and

---

Robert McKay is a geologist for the Geological Survey of the Iowa Department of Natural Resources.

"Unearthing Ancient Amphibians" is reprinted from *Iowa Conservationist* courtesy of the Iowa Department of Natural Resources.

shale; many were fractured and needed to be coated with glue before removal.

The collection, which is undergoing further laboratory preparation and study at the Field Museum, includes head and body remains of extinct amphibians of the subclass Labyrinthodontia and various fossil fish remains. At least two groups of labyrinthodonts, colosteids, and anthracosaurs are represented. These early amphibians superficially resembled salamanders in shape and body form, except that they were much larger, attaining lengths of three feet or more. They possessed large, toothed jaws and were voracious predators whose diet probably consisted mainly of fish. Geologic study of the enclosing and surrounding rock strata has demonstrated that the amphibians lived in shallow, fresh-to-brackish water ponds or lakes occupying lowlands in a subtropical climate. These nonmarine environments of deposition were apparently widespread through western Keokuk County 335 million years ago.

Lakes and waterways on the landscape at the time served as habitat for the giant amphibians and the fish upon which they fed. Scattered depressions within this landscape, such as that preserved at the Delta Site, served as sites where skeletons and bones were deposited, concentrated, buried, and preserved from the destructive effects of weathering and decay.

The 1986 excavation was a great success and removed approximately half of the main bone bed. Further excavation is anticipated during the summer of 1988. The Delta Fossil Amphibian Site has become one of the premier fossil localities in Iowa and North America, and has the potential to fill significant gaps in our knowledge of early land-living vertebrates and their evolution. It truly promises to be an unusually revealing "window to the past." **FM**

"MOTHERS AND DAUGHTERS"

Photographic Exhibit Opens January 27

Closes March 13

Photo by Laura McPhee
Untitled, 1984
Ringoes, New Jersey
8 × 10 silver gelatin print

This unprecedented exhibition of 128 photographs of American mothers and daughters chronicles the first, most lasting, and most crucial bond in every woman's life. Eighty-nine photographers—among them Eudora Welty — have contributed remarkable images that combine to form a varied and deeply insightful vision of the mother/daughter relationship. Large color prints, images combined with text, and mixed-media work are shown side-by-side with more straightforward documentary investigations.

This exhibit was organized by the Aperture Foundation in New York and is free with regular Museum admission.

TIFFANY
150 Years of Gems and Jewelry
Continues through February 6

Paradise Being Lost

A Bittersweet Expedition to the Brazilian Amazon

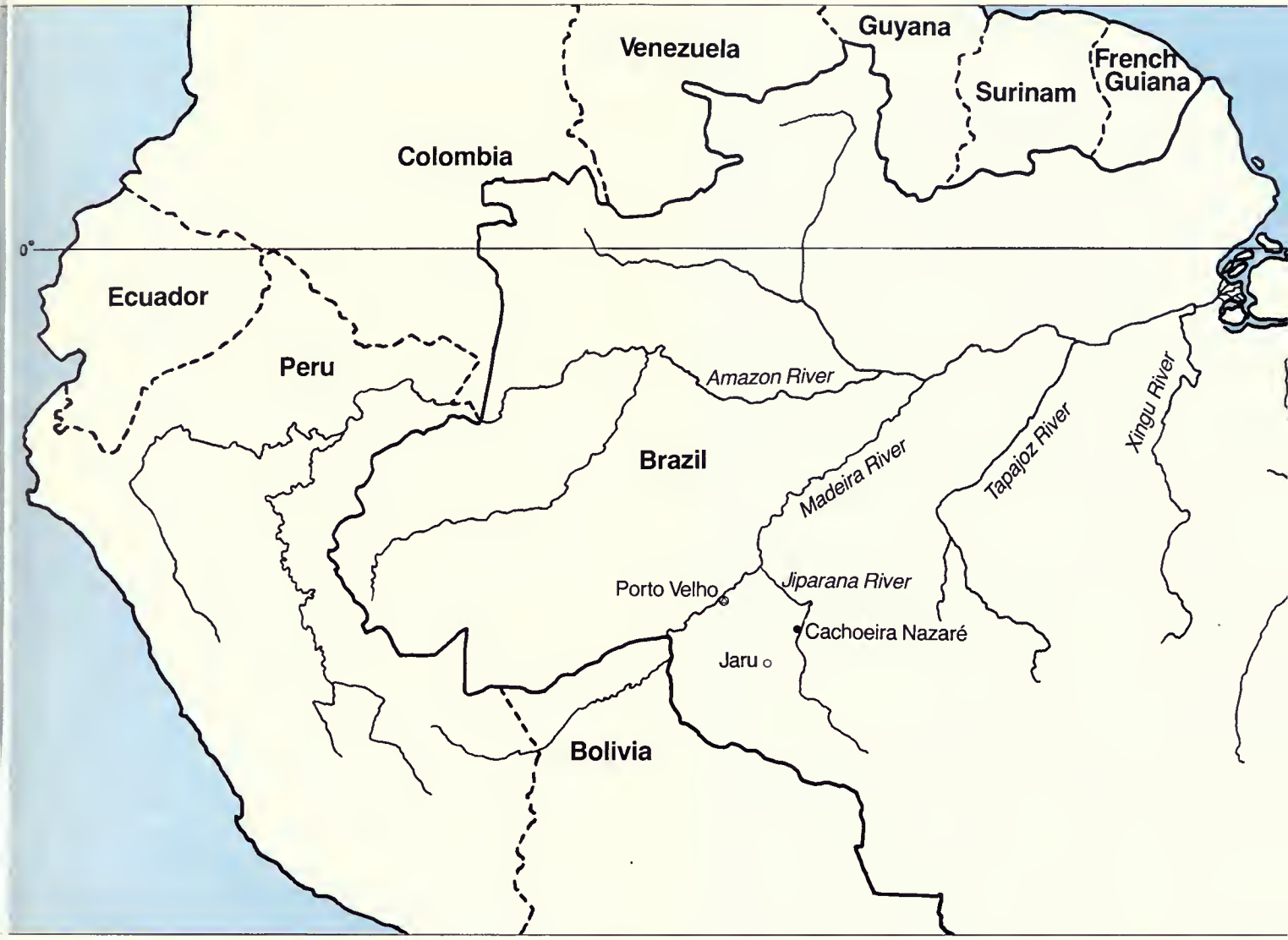
by John W. Fitzpatrick
Chairman of the Department of Zoology and Curator of Birds

Photos courtesy the Division of Birds

In 1985 Brazilian zoologists contacted scientists at Field Museum with a research opportunity that could not be passed up. As part of a far-reaching plan for development of its vast Amazonian interior, the Brazilian government had laid plans to construct up to 70 hydroelectric power plants by damming the waters of its mightiest Amazon tributaries. Several dams already were being surveyed by Brazilian technicians living in remote engineering camps. Two such camps had recently been carved out of the virgin Amazonian rain forest along the banks of the Xingu and the Jiparana rivers (see map).

Difficult access has long prohibited scientists from thoroughly exploring many sections of the interior Amazon basin. Among the least explored of these areas have always been the upland forests between the two great southern tributaries, the Madeira and the Tapajoz. Access to the dam site on the Jiparana, therefore, provided a historic opportunity. Moreover, the aggressive construction of highway systems crisscrossing the Brazilian Amazon has opened the entire region, creating a classic race against time. Can scientists get into these pristine areas and survey their staggering biological diversity before the forests are destroyed by the relentless advance of loggers, farmers, and cattle-ranchers? More important, can scientists, conservationists, government agencies, and local communities join forces to preserve some of these important natural

Jaru's "Broadway." This site was undisturbed forest about 10 years ago.



communities before they are lost forever?

The well-known Brazilian herpetologist Dr. Paulo Vanzolini (director of the Museum of Zoology in São Paulo) obtained funds from the Brazilian government to survey certain of these remote dam sites in their native condition before construction and inundation change them forever. In effect, environmental impact statements would be produced for these construction projects. Besides numerous Brazilian scientists, Vanzolini contacted zoologists at two American institutions, the U.S. National Museum of Natural History (Smithsonian) and the Field Museum. The deal: Smithsonian personnel would study the Rio Xingu site, while Field Museum would explore the more diverse and less well-known site on the Rio Jiparana, in the state of Rondonia. Both teams would be responsible for making faunal inventories, collections, and environmental recommendations at the respective sites in exchange for the rare opportunity to gather data and specimens relevant to their own on-going research projects and to the understanding of the Amazonian ecosystem.

Field Museum ornithologist Scott Lanyon acted quickly, acquiring a grant from the Eppley Foundation in New York to pay for international travel by museum scientists to and from Brazil. Field expenses in Brazil were covered by the Brazilian government. Five bird experts and three mammalogists committed themselves to two months in Rondonia. I was able to squeeze in only three weeks with them, in between other obligations, but was thrilled at the prospect of meeting them at the end of October 1986, in this mysterious, long-hidden region of the Amazon basin.

I was stunned by what I found. The images I

"We progressed toward the wilderness via roads that had been plotted by draftsmen in air-conditioned labs in Brasilia—long, ruler-straight stretches of red clay laid out in huge grids of parallel lines, each about 20 kilometers apart."

Logging activities along the road from Jaru to camp. Terra firme forests in the Amazon basin contain up to 400 species of trees. Trunks with commercial value as lumber are hauled to sawmills, the rest are felled and burned in place to fertilize the nearly sterile clay soil.

brought home struck me as a complex, still unfolding story of two "countries": Brazil, the land of immeasurable natural wealth and beauty, of biological diversity as rich as any place on earth, still filled with uncharted surprises and rewards to the naturalist explorer; and Brazil, the land of "explosive deforestation," where the world's most enormous reservoir of organic diversity is being methodically destroyed through an orchestrated onslaught into the forest frontiers.

Initiation to the Amazon of the 80s

Since 1974, my principal field research on the birds of South America has taken place in Peru, a third world country that is rich in natural and cultural beauty, but oppressively poor economically. The eastern half of Peru is carpeted by a spectacularly diverse Amazonian rainforest and the wet subtropical forests of the eastern slopes of the Andes. Our research has taken us to some of the most remote headwater areas in the Amazon basin, where human populations consist of uncontacted Indian tribes and a few hardy families of subsistence farmers. The Peruvian Amazon is being settled and developed in places, but economic poverty, low population densities and absence of roads (combined with the physical hardships imposed by excessive rainfall) limit the rate at which the forest can be cut down. As a result, scientists like me have been flocking to Peru for a chance to study the Amazon basin of old, the rich and diverse equatorial rainforest in its native splendor, where monkeys literally scrambled down the trees to catch a closer look at the strange bipedal primates gawking at them through binoculars. Through scientific and conservation efforts both national and international, Peru has become a leader within South America in the protection of its tropical resources. In Peru, for now, one can forget what is happening to the great rainforests of the world.

I was unprepared, therefore, for the scenes I experienced by flying "cold turkey" into the very heart of Brazil's onslaught upon the Amazon. My colleagues had been ensconced at the engineering camp for nearly a month, when on Halloween Day 1986, I flew from São Paulo to Porto Velho, the capital of Rondonia. From there, a five-hour bus ride along the paved highway between Porto Velho and Cuiaba brought me to the bustling town of Jaru, where I arrived just after nightfall as the ghosts and goblins of the Amazon past began to haunt me deeply. Saturday morning I spent waiting for the engineers to rescue me, to whisk me away from the 1980s and carry me five hours and two

decades back into the still pristine rainforest, where my toiling colleagues waited. That morning I scribbled the following comments and impressions into my field notebook:

1 Nov. 1986:
Driving out of P. Velho is my first major introduction to the devastation of the Brazilian Amazon. The Amazonian highway system is in full regalia here, with 1-2 mile wide swaths cleared along each of myriad crisscrossing roads. Rugged, abysmal pioneer towns dot the landscape and everywhere there is clearing, sawing, burning, and elimination of the forest. Logging trucks rumble by periodically, dragging 2, 3, or 4 enormous trunks to the sawmills of each town in turn.

In Jaru, trucks outnumber cars 5 to 1, while horse-drawn carts amble alongside both. The Hotel Parana is an "upper-class" place by local standards, with unit air conditioning in each room, primitive toilets and showers, and two beds that aren't bad for rural South America. The proprietor, a good-looking unshaven fellow in a tank-top and flip-flops, handles each minute, each meaningless crisis, each day as it comes. There is a bustle to this town unfamiliar to me from Peru. Every limping passer-by, every grizzled old bike rider and brawny, bearded young stud seems to have a destination; some "negocio" to accomplish. These are transplanted Brazilians, shipped in from the hopeless, seething crowds of the overpopulated south and northeast, imported to the once-green Rondonia land to turn it a productive ubiquitous red-brown, to tame the impenetrable, fearsome forest into habitable streets of dust and debris, to fabricate yet another maze of whitewashed walls harboring the hardware stores, tire shops, supermarkets, gas stations, bars and whore-houses that bring human life together where only monkeys and macaws once lived. Little trucks cruise slowly by with treble loudspeakers blaring forth a continuous gibberish of political Portuguese. It is ignored by everyone, as is the continuous, deep din of diesel engines hauling dead skeletons of mammoth trees out to be carved to pieces, and hauling progress in.

Now available, where once only fruits and insects could be garnered, are glass and plastic bottles with which the landscape may be decorated; newspapers declaring the latest winners of local soccer and volleyball games; bicycles of every color, size, age and condition; blankets, doormats, motorcycle parts and always, lottery tickets hawked as "the only real way to succeed." But in the eyes of a people hungry for industrial development, all these peddlers, hotel owners, and truck drivers are succeeding. This explains the bustle, the cheerful activity, the smiles, the hard-drinking groups of laughing men with arms tightly around each other, the old barefoot women rushing up the street and down with laundry atop their heads, everywhere the infants and naked toddlers running alongside teenage mamas, wondering where papa has gone. The sounds of horses' hooves and motorcycles, the smells of diesel exhaust and dry clay, the sights of bulldozers and radio towers, and the momentous herds of enormous flatbed trucks represent the promise of the Amazon to come, a promise that is arriving and ex-

Base camp near the Rio Jiparana. Temperatures at the clearing reached 38 degrees Celsius nearly every day, but were much cooler inside the forest. Titi monkeys and mixed flocks of birds often moved through these treetops in the morning sun.

ploding faster and more finally than this bird-man ever could have imagined.

In the heart of one of the least explored and richest areas of the Amazon basin, where biological diversity has proliferated through eons and become the earth's most precious reservoir of life, none of these thousands of people will ever hear a Howler Monkey. And they won't care.

Part II
Excitement at a Jungle Camp

Mercifully, the driver from the engineering camp arrived after lunch, finding me dozing in the sultry mid-

We progressed toward the wilderness via roads that had been plotted by draftsmen in air-conditioned labs in Brasilia — long, ruler-straight stretches of red clay laid out in huge grids of parallel lines, each about 20 kilometers apart. From the plane I had seen these cross-hatched scars horizon to horizon as we approached Porto Velho, and now I was on one of them. Near Jaru the forest was cleared for miles on each side of the road, now mostly cattle pasture. As we moved deeper in, the road became newer and the clear-cut swath became narrower. The driver identified the spot beyond which the road was only one year old. For the

Our team (l. to r., crouched): John Fitzpatrick, Mary Anne Rogers, Bruce Patterson, Town Peterson; (standing) Scott Lanyon, Al Gardner, Tom Schulenberg, Doug Stotz, Dave Willard.

day heat. Riding in the back of a dusty Toyota landcruiser, I was whisked back into the South American time and environment I've grown to love, the giant green expanse of pristine lowland rainforest. The drive northeast from Jaru took the whole afternoon.

second half of this four-hour drive, we travelled a road that had slammed through untouched forest only 12 months earlier. Already it had become flanked by half a kilometer of blackened, fallen trunks strewn amidst newly planted seedlings of corn or manioc. Every kilo-

meter or so, a pioneer family paused to rest their backs and watch us speed by. Except for such momentary diversions, these hardy transplants spend all their days felling trees, burning the rubble to fertilize the otherwise sterile clay soil, and planting the crops they will live on.

I arrived at the camp near last light — always around 6:00 p.m. in the equatorial tropics. I was greeted by bearded and happy faces of my friends and colleagues from Chicago, who had been there nearly a month already. They were full of queries about "folks back home," and tales of the forest they were studying. This was a truly remarkable land we had been invited to explore. The eight scientists had made an impressive beginning and eagerly showed me their tent full of voucher specimens to prove it. One specimen in particular had focused the attention of the five ornithologists for the past week, ever since its capture. I would be number six, and it captured my attention instantly. More on it presently; however, the scene must first be set.

The interior Amazon basin consists mainly of two broad habitat types having to do with the presence or absence of seasonal flooding by rivers. Varzea, or "igapo" forest, sits in water several meters deep for over half the year, inundated by the annual flooding of the major rivers. This is a unique forest type, holding a peculiar flora and fauna. These habitats are relatively well explored around the Amazon basin, because historically the scientists entering the region could do so only by the rivers. Surrounded by the richness of river-bottom,. flood-plain forest types, explorers for a hundred years found little reason or incentive to trek overland *between* the rivers. Therefore, the second habitat type was less well inventoried even though it is much the dominant biome in total area represented.

The land between the rivers rises into gentle hills, underlain by laterite, a characteristic red clay soil. Hills are interlaced by myriad small streams, eroding and draining the forest, flowing down toward the rivers and their floodplain shorelines. The forest that grows on these clay soils—rarely or never flooded—is generally called *terra firme.* In many areas the terra firme forest appears less majestic than the annually fertilized forests of the river bottoms. Yet, this land between the rivers can in places be just as diverse as the lower, wetter habitats. For many terrestrial animals, these upland forests are even more diverse. Certainly, from a North American's viewpoint, a terra firme forest looks every bit like a towering green cathedral as one walks beneath it.

Take an Inventory

Storekeepers take inventory so that supplies, equipment, and merchandise that is actually on hand can be compared to what should be on hand.

Homeowners take inventory when their insurance is to be increased.

Yet, persons with wills often forget to keep inventories current. When that happens, their families may be left with the same unnecessary problems that the persons who originally made wills intended to avoid.

Don't take chances with your will being out of balance with your family's needs and your assets. Schedule a meeting with your attorney to take an inventory of what you think your will contains and what it may now actually contain. An out-of-date will is often as ineffective as no will at all, so don't neglect one of the most important inventories you will ever make.

For suggestions on preparing or revising your will, mail the coupon below for the booklet "How to Make a Will that Works."

---------- clip and mail today ----------

To: Planned Giving Office
Field Museum of Natural History
Roosevelt Road at Lake Shore Drive
Chicago, Illinois 60605-2496

☐ Please send me a complimentary copy of "How to Make a Will that Works," at no obligation.

Name _____
(please print)

Address _____

City _____ State _____ Zip _____

Phone: (home) _____ (office) _____

Best time to call: (day) _____ (hour) _____

Red-necked woodpecker (*Campephilus rubricollis*). This is a common, tropical relative of the nearly extinct ivory-billed woodpecker of North America. The forests at Cachoera Nazare support 13 species of woodpeckers. Only one is larger than this crow-sized species.

The Field Museum base camp I drove into that evening had been carved out of a beautiful, tall terra firme forest, up along a gradual hill about a kilometer from the bank of the Rio Jiparana. The place was known as *Cachoeira Nazare,* named after the rapids in the river nearby. The camp was located at one corner of a small network of clearings forming the center of operations for the engineering consortium surveying the dam site. We had been given full use of three huge canvas field tents at the edge of the forest. These plus work tables and a makeshift "pantry" were covered with a jury-rigged roof of plastic tarps. Thirty-five-meter trees spread overhead a few steps away on three sides. A few electric light bulbs illuminated the camp each night until the distant generator was shut off. These lights had just come on as I arrived. I had a few minutes to look around as evening set in, but mostly, I drank in the stories of my friends. By now, they had learned more about the birds and mammals of the region than anyone had ever known.

Almost instantly, Scott Lanyon and Tom Schulenberg (a free-lance ornithologist based in Louisiana) were giving me clues that a major discovery had been made. They enjoyed "holding out" briefly, while I passed a few quizzes, then they brought out their prize. It was a single female specimen of a species I had never seen before. One glimpse and I exclaimed, "That looks like. . . *Clytoctantes*!" (an extremely rare and bizarre species of antbird, known only from a few specimens from northern Colombia.) "It gets better," they said at once, and indeed it did.

They led me through the same process they had followed a week earlier when the bird was first brought in, checking several reference books that represent our bibles for South American ornithology. The new specimen did resemble the Colombian rarity in having a huge, upturned bill, but differed in numerous details. I learned that Dave Willard (collection manager in the Field Museum's Bird Division) had brought the specimen in from the forest nets (where he was when I arrived), and had said flatly, "I think I just collected the best bird of my life!" Doug Stotz, an expert birder and doctoral student at the University of Chicago, subsequently saw a black male of the species on two different mornings, but a second specimen was never obtained despite considerable effort. The single female specimen is almost certainly an undescribed species, a bird entirely unknown to science until Dave found it in the mist nets on Wednesday afternoon the 22nd of October, 1986.

Part III
Cachoeira Nazare, Dam Site #14

It's hard to describe the deep, inner thrill many of us feel while living and working amidst a tropical forest as diverse and little-known as this one. My colleagues already had been in camp four weeks, yet each morning they climbed out of bed in pre-dawn light with the same excitement and anticipation as I had my first morning there.

The tropical dawn starts early with a few scattered bird calls well before light. Often, the distant roars of howler monkeys accompany the first glimpses of giant trees silhouetted against the dawn sky. The bird songs become a chorus as the dim light abruptly gives way to morning. As the treetops gleam with the first sparkles of sunlight, duetting pairs of titi monkeys begin to cackle loudly. Chips and whistles signal the morning activity of bird flocks in the forest canopy.

Schulenberg had slipped out of camp well before dawn to make tape recordings of bird species, many of which had never before been recorded. In an activity only slightly more venerable, Dave Willard also left camp at first light to trek the mile walk through the forest to a long trail of 12-meter nylon mesh nets, set up end to end in the forest understory a few days before. The nets were in place at the site where Doug had spotted the male of the new species. Besides providing our best hope of capturing that bird, the nets serve as our principal means of measuring the bird densities and diversities in tropical forests. By keeping track of every bird that hits the nets and the number of nets and days in the sample, we are comparing the understory bird fauna among all the tropical forest sites we have worked. The nets also serve as our principal means of inventorying the bat fauna in a tropical forest.

Doug Stotz with great potoo (*Nyctibeus grandis*) found ill along a forest trail. This is a huge, nocturnal relative of nighthawks and nightjars. Its loud, gutteral screams on moonlift nights can wake up the soundest sleeper.

I walked with Dave that first morning, and he introduced me to the trail system and this unknown land between the rivers. Dave and I have worked together for 13 years, including many trips into remote sites in the American tropics. He excitedly pointed out

things about this forest that we had never encountered before. A raucous, staccato call of a bird overhead stopped us in our tracks. "That's *Phoenicercus nigricollis*—darn hard to see but it's right here every day." The "black-necked red cotinga" is a jay-sized bird with brilliant red-orange plumage. It is rare over much of its Amazonian range, and was new to Dave and me. It was common in this forest. So were dozens of other birds, little known by scientists and poorly represented in the world's scientific collections. In the process of helping Brazil assess the fauna of a doomed forest, we were filling in a huge void in the world's knowledge of Amazonian diversity.

White-breasted antbird (*Rhegmatorhina hoffmansi*). Although rare in the world's scientific collections, this was among the commonest species at our camp.

To ornithologists familiar with the known distributions and abundances of South American birds, we had stumbled upon a gold mine. This tall forest between the Rio Madeira and the Rio Tapajoz harbored a community of birds numbering over 460 species! Nobody in the history of Brazilian ornithology had ever encountered and surveyed a community this rich. The bat fauna was equally stunning: 47 species, nearly a record for a single lowland forest locality.

Later that first morning I walked to the river with Town Peterson, another student at the University of Chicago, enjoying his first bewildering taste of the tropics. Town pointed out trails where previous netting samples had been taken before my arrival. He showed me the spot, amidst dense vine tangles not far from camp, where the mystery bird had been captured. At the river, as the day began to heat up, we watched hummingbirds and a large group of red-bellied conures (*Pyrrhura rhodogaster*) foraging in a flowering tree. These parrots, again little known by scientists, were seen daily in noisy flocks of thirty or more individuals throughout the forest.

The Rio Jiparana is about 200 meters wide where we studied it, a deep and fast-flowing channel flanked by rocky banks and the ever-present, evergreen tropical forest. In 1909, Colonel Rondon of the Brazilian army had descended past this point while charting the river for the first time. In 1914 Rondon (after whom this Brazilian state of Rondonia was named), together with Theodore Roosevelt and his son Kermit would navigate the mysterious "River of Doubt" only fifty miles to the east, in a harrowing 60-day adventure filled with tragedy and narrow escapes. That river is now called Rio Roosevelt, and its 1914 exploration by the ex-president resulted in the only significant scientific collections from these Brazilian forests, until now.

It was painful for us to know, while gazing at the river, that the entire scene before us would be under hundreds of feet of water within several years. The site at which the huge cement dam would be constructed was clearly visible, marked by white flags and marker-posts along the opposite bank. We would be among the last humans ever to sit on the banks of the Jiparana as

Rondon knew it and as it had been for millennia before him. All these rare birds, little-known mammals, undescribed insects and plants thriving and evolving around us would be destroyed without a trace by the rising waters behind Dam Site #14.

When tropical forest is inundated to treetop heights, the plants, of course, can go nowhere. Adapted to dry footing, they quickly die and slowly rot away as the water table overtakes them. Animals meet a slower but no less certain fate as they struggle toward higher ground. Their deadly dilemma: drown in the artificial lake or migrate into new forest already teeming with vigorous, territorial representatives of their own species (or closely related ones where the forest type is different). In a typical tropical forest, thousands of separate species of animals and plants exist at or near their ecological "carrying capacity," the whole community persisting in a delicate equilibrium of numbers. Massive perturbations in adjacent areas, whether caused by bulldozer or rising water, cannot change the numbers of animals a given piece of forest patch can hold. Animals try to invade new ground, but they fail, living for a time as hungry nomads before perishing without a home. As humans alter or destroy habitats the world over, many of us seem to have trouble acknowledging that this action annihilates all the inhabitats with the same thoroughness and finality as if we had killed each of them individually with fire or gun.

Snow-capped manakin (*Pipra nattereri*), a fruit-eating bird of the forest undergrowth.

White-fronted nunbird (*Monosa morphoeus*). This species lives in family groups, which sing together in noisy duets or trios in the treetops.

This was the bittersweet conscience we bore throughout our study at Cachoeira Nazare. Hour by hour, day by day, we grew to know the forest intimately. Invariably, one grows to love a tropical forest as one begins to understand it. Each site has a slightly different character from every other. This one, diverse as it was, struck many of us as unusually dry. The red clay soil gave way to loose sand in places, supporting pineapple-like terrestrial bromeliads. Few arboreal airplants or mosses clung to the trunks, indicating that daily moisture levels in the air were rarely saturated. Indeed, the midday heat was scorching and oppressive. At our clearing the temperature neared 38 C. (100 F.) almost every day. Although the dark forest interior remains considerably cooler even in mid-afternoon, a period of inactivity routinely engulfs the forest during each day's hottest hours.

Around noon, profusely perspiring biologists tended to return to camp as the forest grew quiet. Parched throats quenched, each person set about the tasks of specimen preparation. Bruce Patterson (head of the Division of Mammals at Field Museum) and Al Gardner (mammalogist at the U.S. National

Museum), skinned mammals from several lines of traps. Field Museum technical assistant Mary Anne Rogers would usually be preparing microscope slides of chromosomes from some of these mammals, laboriously extracted from their blood cells. Many species of rodents can be distinguished from one another only by this method. Scott Lanyon, after each bird skinned, would extract tissue from the carcass and freeze it in a portable freezer filled with liquid nitrogen. These tissues would be analyzed in the laboratories back in Chicago so that their molecular and genetic properties can be compared. Doug Stotz was in charge of preparing skeletal specimens while his fellow student Town Peterson skinned birds and extracted their chromosomes. Dave Willard, master of the mist-netting program, skinned birds when not installing or checking nets. Tom Schulenberg, in between bird skins, would catalog his extensive tape recordings each day, occasionally pausing to play us a song or two of birds whose voices we were still learning. My own "niche" mostly involved censusing and collecting birds from high in the forest canopy, using a 20-gauge shotgun and very fine lead shot.

Specimens being sun-dried at base camp. We often collect a few representatives of each species in order to document for all time the fauna of such little-studied areas. These specimens will join others in Brazilian and U.S. museums, where they are preserved for comparison and study by the international scientific community.

Often, distant thunderheads could be seen and heard over the forest. Several times they migrated overhead, drenching us for an hour or two of blinding, tropical rain, in a welcome relief from the sun and heat of most afternoons. Once, a huge squall line hit the camp with such sudden force that it blew apart our makeshift plastic roof. With passionate dedication to protecting the specimens, we frantically relashed the tarps, feeling a bit like crew members high in the masts of a clipper ship, pulling in the sails as the gale soaked us to the skin.

Late afternoon net checks and forest walks produce new flurries of information and specimens each day. And, suddenly, it is night. The headlamps come out, and the mammalogists take their turn stalking the trails. Their subjects, of course, are largely nocturnal—and so must be mammalogists. For ornithologists, skinning and note-writing would take us to the end of the lights (and sometimes well beyond). As each finishes his day, the respective headlamp and consciousness flick off. The dawn comes early.

Part IV
Results and Postscripts

Time flew by at Cachoeira Nazare. We packed out of

Dam Site #14 toward the end of November, having documented that an unexpectedly high diversity of birds and mammals would be affected by the flooding. As requested by Brazil, we prepared a thorough, 110-page report on our findings and submitted it by mid-January. Published articles will follow for several years hence. Our species lists, quantitative measurements, and collections already stand as major contributions to Brazilian biology and conservation. We hope they will have lasting influence on the planning and execution of future hydroelectric projects in the Amazon basin. In addition, we hope they can be used by Brazilian scientists and students in their increasing efforts to inventory and understand their country's resources.

Our most important conclusions involve the existence and need for protection of a previously unsuspected pocket of biotic diversity in the forests between the Madeira and the Tapajos. Much of this land remains unexplored, and its flora and fauna still are largely unknown, save for the birds and mammals we studied. Dam construction and associated flooding *can* be accomplished without permanent damage to this diversity, but only with proper attention to conservation around the lake's perimeter. Present rates of settlement in the state of Rondonia are so high that public access to the water's edge would result in denuding the forest around its banks. Consequences of this would be disastrous, both in terms of soil runoff (clogging the lake and dam) and in loss of species diversity. Preservation of native life and water quality within the lake also depends upon the persistence of intact forest around the shoreline. We recommend that a wide "buffer zone" of untouched forest be preserved around the entire perimeter of the reservoir, providing a corridor for movement of forest-adapted animals and a genetic reservoir of plant species endemic to the region. This buffer zone should include a connection to a nearby biotic reserve of considerable size. Most important, the area should be intensively studied periodically, during and after the dam construction. Only with this kind of monitoring can we ever hope to know in detail the scope of the environmental changes we bring about by damming the waters of the Amazon basin.

The great, uncharted tropical forests of Rondon and Roosevelt's day are disappearing. Those that remain are being altered irrevocably by man. It is impossible to travel and work in Rondonia without facing this merciless fact head-on. The global consequences of these changes are just now beginning to receive the attention they warrant. Fortunately, governments such as Brazil's are beginning to become aware of the monumental biotic resources they harbor in their native forests. In our small way, museum scientists engaged in inventorying these resources contribute to this awareness. Only by studying, bit by bit, the individual pieces of the gigantic puzzle of tropical diversity can we hope to understand how it arose and how it is maintained. Only with this understanding can we humans, in turn, hope to predict and measure how our activities and developments upon our planet will affect its future, and our own. **FM**

Yellow-shouldered grosbeak (*Caryothraustes humeralis*), a rare inhabitant of the highest treetops.

Collared puffbird (*Bucco capensis*), a distant relative of woodpeckers and very difficult to see as it sits motionless for minutes on end in search of insects.

Sophia Anastasiou-Wasik and Ron Testa

New Permanent Exhibit

Japanese Lacquer Wares

The gift of Carl and Jeanette Kroch

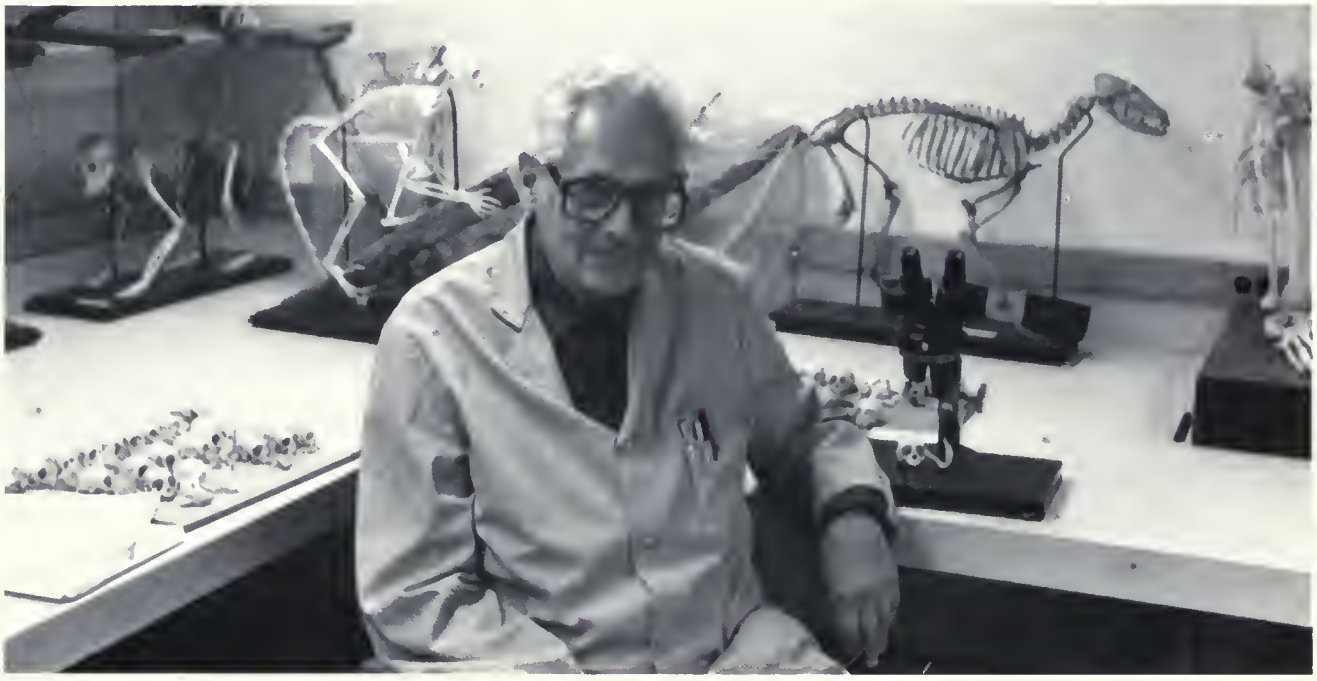
THE STUFF of DREAMS

Native American Dolls

Continues through January 15

A Celebration of
PHILIP HERSHKOVITZ
EMERITUS CURATOR OF MAMMALS

by BRUCE D. PATTERSON
Associate Curator of Mammals and Head, Division of Mammals



84917

The distinguished career of Emeritus Curator Philip Hershkovitz is celebrated at this time with Field Museum's publication of a landmark volume on South American mammals, *Studies in Neotropical Mammalogy: Essays in Honor of Philip Hershkovitz*. Hershkovitz, now 78, has devoted most of his 40 years at Field Museum to the study of South America's diverse and poorly known mammal fauna. In the course of five decades of expeditions and museum studies, Hershkovitz has published definitive treatments of most groups of mammals of that continent.

Studies in Neotropical Mammalogy is a collection of 25 original articles written expressly for this occasion and published in *Fieldiana*, the Museum's continuing scientific serial publication (for complete contents see page 30). Contributed by 42 authors, many of them South Americans, and edited by Bruce D. Patterson and Robert M. Timm of Field Museum's Division of Mammals, the papers focus on the origins, relationships, natural history, and present status of many groups of Neotropical mammals. Because this fauna is increasingly imperiled by human encroachments on natural ecosystems, the volume is a timely contribution that may aid national and international efforts for conservation.

The following article is adapted from the volume's opening article, "A biographical sketch of Philip Hershkovitz, with a complete scientific bibliography," by Bruce D. Patterson.

PHILIP HERSHKOVITZ was born October 12, 1909, in Pittsburgh to Aba and Bertha Halpern Hershkovitz, the second of four children and their only son. He attended Pittsburgh public schools, graduating from Schenley High School in February, 1927. In 1929, he enrolled at the University of Pittsburgh, where he majored in zoology, serving as an undergraduate assistant in

that department during 1930-31. Having exhausted Pittsburgh's course offerings in zoology after two years and seeking to pursue a career in mammalogy, he was advised to transfer to Harvard, the University of Michigan, or the University of California, Berkeley. Proximity won out and in his junior year he transferred to the University of Michigan at Ann Arbor. There he became an undergraduate assistant in the Museum of Zoology, working under Lee R. Dice, professor and curator, during 1931 and 1932. He supplemented the meager earnings of this position with taxidermy jobs, which supported him during the early years of the Great Depression. His first fieldwork, during the summer of 1932, carried him to Texas' San Marcos region to collect blind cave salamanders (*Typhlomolge rathbuni*) for Professor Uhlenhuth of the University of Maryland Medical School. Mainly interested in mammals, Hershkovitz wanted also to collect these in areas near the caves, but Dice could spare no traps and advised him to purchase some in Texas.

While hitchhiking from Ann Arbor to Texas, Hershkovitz stopped to visit friends in Chicago. There, a chance visit to the Field Museum secured him the traps and supplies he needed and seemingly set the course of his later career. Colin Sanborn, then curator of Mammals during Wilfred Osgood's tenure as chief curator of Zoology (1921-41), befriended Hershkovitz and loaned him the necessary supplies. As a consequence, the mammals he collected in Texas during that first of many field seasons were deposited in the Field Museum collections. He now maintains that his chance visit to the Field Museum in 1932 indelibly fixed that institution as the place at which to pursue his career goals.

Hershkovitz's formal education was postponed in 1933 by the worsening economic situation. No longer able to afford tuition, he sought advice on subsistence during the Depression, and was told that Ecuador and Paraguay were undoubtedly the least expensive countries in this hemisphere in which to live. Transportation costs decided the issue, and in 1933 he set sail via the Grace Line from New York to Guayaquil, Ecuador for the whopping sum of $600, one-way.

He stayed in Ecuador until 1937. During this period, he mastered Spanish and learned how to live off the land in the Neotropics. His boots disintegrated after six months' time and thereafter he went barefoot. He assembled a fine collection of Ecuadorian mammals for the University of Michigan's Museum of Zoology, supporting his fieldwork in part by selling horses bought on the Peruvian frontier.

He then returned to the University of Michigan, graduating in 1938 with a B.S. degree. By this time, Professor Dice had transferred from the Museum of Zoology to the Laboratory of Vertebrate Genetics, and William H. Burt had assumed the museum curatorship. Hershkovitz spent the period 1938-41 enrolled in the university's graduate school, working on his Ecuadorian collection under Burt's direction. From 1939 to 1941, he was supported in this work by a graduate assistantship. In 1940 he received his M.S. degree and entered the doctoral program.

Two years before the expected completion of this program, the curator of reptiles and amphibians at UMMZ, Helen Gage, told Hershkovitz about the Walter Rathbone Bacon Travelling Scholarship of the United States National Museum. This program was customarily reserved for postdoctoral support, but Mrs. Gage strongly urged him to apply immediately. Thus persuaded, Hershkovitz submitted a brief proposal for work in the Santa Marta region of northern Colombia; his compliance with Mrs. Gage's wishes in this matter was so perfunctory that he failed to include a map of the proposed itinerary. But Remington Kellogg at the National Museum had long wished to obtain a Bacon Scholar for the Mammal Division and wrote Hershkovitz for the omitted itinerary. Much to his surprise, Hershkovitz was awarded the scholarship. He went immediately to Washington, where he spent two months studying the then very poor collection of Neotropical mammals before going to Colombia. There, he spent two years (1941-43) collecting mammals, other vertebrates, and external parasites. The resulting collection was the National Museum's first large and representative Neotropical mammal accession.

In 1943, Hershkovitz's work was interrupted by World War II, and he returned to Ann Arbor to enlist in the Armed Services. He was assigned to the Office of Strategic Services (OSS) and served from 1943 to 1946 in the European Theater. While serving in France he met Anne Marie Pierrette, whom he married in 1946. He returned with her to the United States, where in 1946 and 1947 he continued his Bacon Scholarship studies of Colombian mammals in Washington. The first of three children (Francine, Michael, and Mark) was born in 1947.

About this time, he was contacted regarding the opening of a curatorial position at the Field Museum, an opportunity he eagerly hailed for several reasons: 1) the comprehensive collections of Neotropical mammals at Field Museum would be a tremendous resource for what he had already decided would be his life's

Philip Hershkovitz and friend (*Micoureus cinereus demerarae*, a mouse opossum) in the Sierra Negra of northernmost Colombia.

work; 2) he had the highest regard for W. H. Osgood, who as a principal authority on South American mammals would be a great personal resource on which to draw; 3) the press of family responsibilities was making continuation of his graduate studies increasingly difficult; and 4) aspirations to a curatorial position had been the sole incentive for his graduate program; a curatorial position would make the graduate degree superfluous. Thus, when Field Museum offered him the job, he eagerly accepted, knowing full well that it marked the end of his graduate program at Michigan.

Osgood's death in June, 1947, ended his hopes for what might have been a remarkable apprenticeship. Nevertheless, the sacrifice of the doctoral degree still seemed a miniscule loss, not without precedent at Field Museum and other institutions at that time. Osgood himself had received his doctorate from the University of Chicago some nine years after becoming curator, well after completing some of his most significant work (*e.g.*, revisions of pocket mice and deer mice). Another stellar example was Karl P. Schmidt, chief curator of Zoology after Osgood, a most distinguished herpetologist-ecologist, and member of the National Academy of Sciences, who never entered a doctoral program.

Upon his arrival at Field Museum, Hershkovitz found an uncurated backlog of some four or five years. Nevertheless, he wasted little time in returning to the field, prompted in part by postwar housing shortages in Chicago. (One can almost hear him now, telling former Museum Director Clifford C. Gregg that the nearest affordable housing was in Bogota!) In 1948, the Hershkovitz family moved to Colombia, where he resumed his inventory of that country's mammals. He remained in Colombia until the press of curatorial duties and a gently delivered ultimatum from Sanborn finally recalled him to Chicago in 1952.

The collections he made in Colombia, first for the National Museum, then for the Field Museum, were to be the heart of all his subsequent research. But unlike others studying the mammal faunas of specific geographical regions, Hershkovitz found it unsatisfying to assess the systematics of Colombian mammals without crossing national boundaries. Studies of a species or species group in Colombia led him to evaluate its context within genera, families, and even orders; and the remarkable diversity of Colombia's mammal fauna led him into most major groups and most Neotropical regions. In the course of his career, he has published dozens of generic, tribal, and familial revisions, covering all twelve orders of Neotropical mammals. Few boundaries of space and time have withstood the onslaught of his studies of Neotropical mammals. As examples one can point to the cosmopolitan *Catalog of Living Whales* (1966) — after all, most cetaceans do occur in South American waters—and studies of Oligocene and later fossils of South American monkeys, published during the 1970s and 80s.

One senses that the Department of Zoology during Hershkovitz's early years was a stimulating, harmonious one. Chief Curator K. P. Schmidt took an almost paternal interest in junior staff and served as a confidant on the most personal of matters. In addition to Colin Sanborn, who was most considerate of his junior colleague's interests and talents, Hershkovitz shared mammalogical problems and topics with D. Dwight Davis, curator of Vertebrate Anatomy, and Bryan Patterson, curator of Vertebrate Paleontology.

Hershkovitz studying geographic and nongeographic variation in mouse skulls as a prelude to his 524-page tome *Evolution of neotropical cricetine rodents (Muridae), with special reference to the phyllotine group,* published in *Fieldiana: Zoology* in 1962. 86651

During the early and mid-1950s, Hershkovitz established a vigorous and productive research program and participated in all aspects of departmental affairs.

However, upon Schmidt's retirement in 1957, Austin S. Rand, an ornithologist, became chief curator of Zoology, and neither Rand nor Hershkovitz did much to disguise his antipathy for the other. Over the ensuing years, Hershkovitz increasingly detached himself from museum operations, culminating with Joseph Moore's appointment as curator of Mammals in 1961, and Hershkovitz's appointment that year to research curator. No one before or since has held this title at Field Museum. Hershkovitz formally retired in 1974, although his work continues unabated as emeritus curator. During his career, he has assisted countless students in mammal projects but served on only a single graduate committee, that of Jack Fooden, now a renowned biologist and primate specialist in his own right and a research associate of Mammals at Field Museum.

Few scientists can claim the independence in research that is indicated in Hershkovitz's bibliography. Of his approximately 300 scientific, popular, and encyclopedia articles, only three are collaborations. The first (1938), with William P. Harris, an important benefactor of the Museum of Zoology, Michigan, was suggested by Burt in recognition of Harris's interests in squirrels and in token repayment for his patronage of the museum. The second (1945), with Paul Rode, came about one afternoon in the Museum National d'Histoire Naturelle in Paris when Hershkovitz offhandedly offered a solution to a nomenclatural problem that Rode faced in his research. Rode insisted that Hershkovitz share authorship on the resulting paper. Later, after further study in the United States, Hershkovitz arrived at a contrary opinion and wrote a paper, with Rode as co-author (1947), correcting their earlier article.

For almost 50 years, Hershkovitz has focused his research on Neotropical mammals — their origin, evolution, dispersal, classification, nomenclature, and systematics. Specialists in these fields are well aware of his tremendous impact. However, he is perhaps most widely known for his work on three general topics of Neotropical mammalogy: faunal origins, metachromism (the evolution of hair color via pigment loss) and New World monkeys. It would be folly to attempt to review all of his research, and more definitive appraisals on selected topics can be found throughout the newly published volume in his honor. However, some

comments on these general issues seem in order.

As late as his taxonomic revision of leaf-eared rodents (1962), Hershkovitz adhered to traditional notions of the derivation of certain South American groups, notably the sigmodontine rodents, from North and Middle American stocks. This hypothesis of origins has been advocated by G. G. Simpson, B. Patterson, R. Pascual, L. G. Marshall, and S. D. Webb. However, in the early 1960s, Hershkovitz was approached by Rupert Wenzel, then curator of Insects at Field Museum, who questioned him on the evidence for Pliocene-Pleistocene origins of the sigmodontines. Wenzel's studies of external parasites of Panamanian mammals suggested much earlier, South American origins. His interest piqued, Hershkovitz reviewed available evidence, synthesizing continental drift (which was then becoming established in geological circles) and various studies of recent mammals. He concluded that continental drift permitted a much greater role for paleotropical stocks in the origin of the South American fauna than was allowed by the Simpsonian school, which in turn suggested a much greater time-period for independent evolution. Interestingly, and perhaps even characteristically, Hershkovitz concluded that South American rodents were not only *not* derived from North American stocks but instead gave rise to them. These views were published in 1966, 1969, and 1972.

Hershkovitz developed singlehandedly the theory of metachromism, first published in 1968. Since then he has used it repeatedly in describing geographic variation in New World monkeys. However, the origins of this concept stem from his earlier work on certain squirrels (*Sciurus granatensis* group) in northern Colombia. Here, populations of squirrels thoroughly isolated from one another show similar progressions of pelage patterns. Few workers other than Neotropical primatologists (and not all of these) have accepted his interpretations, although the theory is potentially applicable to a variety of other groups (mostly diurnal ones) showing pelage pattern variations.

Finally, some explanation seems warranted for Hershkovitz's current devotion to primates. Indeed, many recent workers unschooled in mammalian systematics think of him as a primatologist. Nothing could be further from the truth, as he hastens to point

Hershkovitz and staff artist E. John Pfiffner preparing scientific illustrations for *Living New World Monkeys (Platyrrhini)*, Vol. I, published by the University of Chicago Press in 1977. This lavishly illustrated opus of 1,117 large-format pages was the first of a three- or four-part series covering all New World monkeys. 89480

Forty years of distinguished service to Field Museum and Zoology.
84165, 87363, 89299, 90174, 92453, 83631

out. He had published several articles on primates in the course of working up his Colombian collections, but gave these taxa no special attention until the 1960s. Then government funding for primate studies soared, in large part because of interest in biomedical applications, especially for the complex and taxonomically confused family Callitrichidae (tamarins and marmosets). For almost twenty years, Hershkovitz has focused first on the Callitrichidae, now the Cebidae (larger New World monkeys, including capuchin, spider, and woolly monkeys). His slower progress through these groups is attributable to the vast body of current knowledge about them. His 1977 opus on callitrichids, *Living New World Monkeys (Platyrrhini)*, Vol. 1, serves as a model synthesis of data from skin and skull anatomy with data concerning biochemistry, chromosomes, blood proteins, epidemiology, ecology, and behavior. In a 1982 article, mammalogist Ronald Pine (also a research associate of Field Museum) referred to this work as "the most heroically monumental revisionary monograph ever devoted to a Neotropical group." (Vol. 6, Spec. Publ. Ser., Pymatuning Lab. Ecol.) By Hershkovitz's own estimation, monkeys do not culminate his studies on Neotropical mammals, but rather represent a large and complex group to be covered in his attempt to treat all South American mammals. After a decade of work on volume two, he has recently completed generic revisions of cebids lacking prehensile tails, including night and squirrel monkeys, sakis, and titis, and is beginning comparative studies of organ systems.

In October, 1987, Hershkovitz turned 78 years old. The 14 years he spent in the field in South America have served him well, for he seems younger than many men 15 years his junior. Indeed, he has just returned from a lengthy trip to Brazil, where he has been studying monkeys in museums and mice in the field with Barbara E. Brown, his technical assistant for 13 years and a longtime friend and supporter of the Museum. While in Chicago, his tireless energy is best indicated by his habitual use of stairs rather than elevators (even his two offices in the Museum are three floors apart) and a museum workday that extends from 9 am to 6 pm, uninterrupted by coffee breaks or even lunch. Visitors to his home, now within walking distance of the Museum, know of his office there which relieves the chronic insomnia of advancing years. He is an outstanding cook, a genial host, a trusted and valued friend, as well as an awesomely productive scientist. **FM**

Field Museum of Natural History
Membership Department
Roosevelt Road at Lake Shore Drive
Chicago, IL 60605-2499

MISS MARITA MAXEY
7411 NORTH GREENVIEW
CHICAGO IL 60626

FIELD MUSEUM OF NATURAL HISTORY BULLETIN

February 1988

"Welwitschia the Wonderful"

page 22

Field Museum of Natural History Bulletin

Published since 1930 by
Field Museum of Natural History
Founded 1893

Editor/Designer: David M. Walsten
Production Liaison: Pamela Stearns
Staff Photographer: Ron Testa

BOARD OF TRUSTEES

Robert A. Pritzker
Chairman
Mrs. T. Stanton Armour
George R. Baker
Robert O. Bass
Gordon Bent
Mrs. Philip D. Block III
Willard L. Boyd,
President
Robert D. Cadieux
Worley H. Clark
James W. Compton
Frank W. Considine
William R. Dickinson, Jr.
Thomas E. Donnelley II
Thomas J. Eyerman
Marshall Field
Ronald J. Gidwitz
Clarence E. Johnson
Richard M. Jones
John James Kinsella
Robert D. Kolar
Hugo J. Melvoin
Leo F. Mullin
James J. O'Connor
James H. Ransom
John S. Runnells
Patrick G. Ryan
William L. Searle
Mrs. Malcolm N. Smith
Robert H. Strotz
Mrs. Theodore D. Tieken
E. Leland Webber
Blaine J. Yarrington

LIFE TRUSTEES

Harry O. Bercher
Bowen Blair
Stanton R. Cook
Mrs. Edwin J. DeCosta
Mrs. David W. Grainger
Clifford C. Gregg
Mrs. Robert S. Hartman
Edward Byron Smith
John W. Sullivan
J. Howard Wood

CONTENTS

February 1988
Volume 59, Number 2

FEBRUARY EVENTS AT FIELD MUSEUM 3

EXHIBITION CONSERVATION
by Catherine Sease, Associate Conservator, Anthropology . . . 5

JOHN A. KAKARUK: PAINTER OF INLAND ESKIMO LIFE
by Charles V. Lucier and James W. VanStone,
Curator of North American Archaeology and Ethnology. . . . 14

WELWITSCHIA THE WONDERFUL:
Life as a Survivor in the Desert of Southwestern Africa,
by Peter R. Crane, Associate Curator of Paleobotany,
and Catherine D. Hult, Laboratory Assistant, Geology 22

FIELD MUSEUM TOURS 30

COVER
Welwitschia mirabilis, one of the most extraordinary members of the plant kingdom, shown here in a diorama in Hall 29: "Plants of the World." This bizarre inhabitant of African desert regions is the subject of an article by Associate Curator Peter R. Crane and Laboratory Assistant Catherine D. Hult, pages 22-29. B80266

Seen the Tiffany exhibit yet?
Hurry!
"Tiffany: 150 Years of Gems and Jewelry"
remains on view only through
Saturday, February 6

* * *

"Mothers and Daughters"
Unprecedented exhibition of 128 photos of
American mothers and daughters remains on
view through March 13

Field Museum of Natural History Bulletin (USPS 898-940) is published monthly, except combined July/August issue, by Field Museum of Natural History, Roosevelt Road at Lake Shore Drive, Chicago, IL 60605-2496.

Copyright ©1988 Field Museum of Natural History.

Subscriptions: $6.00 annually. $3.00 for schools. Museum membership includes *Bulletin* subscription.

Opinions expressed by authors are their own and do not necessarily reflect the policy of Field Museum. Unsolicited manuscripts are welcome.

Museum phone: (312) 922-9410. Notification of address change should include address label and be sent to Membership Department. Postmaster: Please send form 3579 to Field Museum of Natural History, Roosevelt Road at Lake Shore Drive, Chicago, IL 60605-2496. ISSN: 0015-0703.

EVENTS

Black Traditions

The beauty and excellence of traditional African crafts are being perpetuated by some of Chicago's most skilled artisans and performers. Experience the rich atmosphere of an African bazaar. Tour a drum maker's yard and see the transformation of a simple log to a powerful musical instrument. Try your hand at playing the finished product. Enjoy the legends of Africa's past and performances by some of Chicago's most exciting theatre groups. Join with Field Museum in celebrating the richness and vitality of Black American Traditions.

Saturday and Sunday, Feb. 6, 7

1:00 to 3:00pm

Folk Art—demonstration

Derek Webster creates fantastic and colorful caricatures of the life around us using found objects and wood scraps.

2:00pm

African Bazaar

Garments, dancers, musicians, and merchants illustrate the beauty of African American culture.

Saturday and Sunday, Feb. 20, 21

1:00 to 3:00pm

Shakere—demonstration

Shakere are African percussion instruments made from gourds and covered with a fine slightly loose netting of glass or wooden beads. Watch as Amira demonstrates how these beautiful instruments are made and played.

2:00pm

Stories and Folktales with Shanta

Shanta enchants you with traditional African, African American, and original tales enhanced with a variety of African musical instruments.

Saturday and Sunday, Feb. 27, 28

1:00 to 3:00pm

The Drummer's Craft—demonstration

Visit with Musa Mosely, local drum maker, as he creates a drum for you to play.

2:00pm

Stories and Folktales with Nora Blakely

Nora Blakely captivates you with exciting legends of Africa's heroes and scary stories of the wonders of the world.

All Black Traditions family activities are free with Museum admission. Tickets are not required.

World Music Program

Weekends in February

1:00pm and 3:00pm

Music communicates in many ways. It is something that can be shared by all of us, whether or not we have common lifestyles, beliefs, or even languages. From the gentle harp of Light Henry Huff to the lively and spirited stories and songs of Shanta, February is a musical celebration at Field Museum.

Feb. 6	1:00pm:	☐ Chinese Music Society of North America
		☐ Amira—African Shakere
	3:00pm:	☐ Chicago Beau —Blues Harmonica
Feb. 7	1:00pm:	☐ Chinese Music Society of North America
		☐ Amira—African Shakere
	3:00pm:	☐ Chicago Beau —Blues Harmonica
Feb. 13	1:00pm:	☐ Chinese Music Society of North America
	3:00pm:	☐ Chinese Music Society of North America
Feb. 14	1:00pm:	☐ Raices del Ande—Latin American Folk Music
	3:00pm:	☐ Raices del Ande—Latin American Folk Music
Feb. 20	1:00pm:	☐ Alas Poets
		☐ Light Henry Huff—Harp
	3:00pm:	☐ Fan Wei-Tsu—Chinese Zither
		☐ Sheri Scott—Vocals
Feb. 21	1:00pm:	☐ Alas Poets
		☐ Light Henry Huff—Harp
	3:00pm:	☐ Fan Wei-Tsu—Chinese Zither
		☐ Sheri Scott—Vocals
Feb. 27	1:00pm:	☐ Shanta—Storyteller
	3:00pm:	☐ Keith Eric—Music of the Caribbean
Feb. 28	1:00pm:	☐ Shanta—Storyteller
	3:00pm:	☐ Keith Eric—Music of the Caribbean

The World Music Program is supported by the Kenneth and Harle Montgomery Fund and a City Art IV grant from the Chicago Office of Fine Arts, Department of Cultural Affairs.

Adult Programs

Courses for adults begin the week of February 15. "Africa: A Continent Misunderstood" begins Thursday, February 25. This series features some of Chicago's finest scholars discussing African culture and history. Other courses beginning in February include "Conquest of the Incas," "Conversational Chinese," and "Mandar Silkweavers."

"MOTHERS AND DAUGHTERS"

Photographic Exhibit

Closes March 13

Photo by Laura McPhee
Untitled, 1984
Ringoes, New Jersey
8 × 10 silver gelatin print

This unprecedented exhibition of 128 photographs of American mothers and daughters chronicles the first, most lasting, and most crucial bond in every woman's life. Eighty-nine photographers—among them Eudora Welty — have contributed remarkable images that combine to form a varied and deeply insightful vision of the mother/daughter relationship. Large color prints, images combined with text, and mixed-media work are shown side-by-side with more straightforward documentary investigations.

This exhibit was organized by the Aperture Foundation in New York and is free with regular Museum admission.

EXHIBITION CONSERVATION

by Catherine Sease,
Associate Conservator, Department of Anthropology

What is the job of an exhibition conservator? To this question, most visitors would reply, "restore objects in a lab." They would be surprised to learn that much of a conservator's work occurs in the public areas of their museum. After objects have been placed in display cases, conservators do not simply forget about them. These objects on exhibition must be looked after just as carefully and conscientiously as those specimens in storage, those that go out on loan, and those studied in work areas.

Conservators can be thought of as doctors for artifacts. Like physicians, we are concerned with maintaining the physical well-being of all the objects in the collections under our care. When necessary, of course, we do treat objects by cleaning them, repairing them, and the like. More often, however, we practice preventive conservation. Again, the medical analogy is perfectly apt, as the theory behind preventive conservation is similar to that of preventive medicine: if objects are handled and cared for properly, the possibility of damage and deterioration is minimized.

Indications that preventive conservation is taking place in an exhibition hall are generally there for one to see, but museum visitors are not always aware that this is what they are seeing. Have you ever wondered about those curious little dials to be seen in the corners of some museum cases? What about the shoe box-size machines with pens continuously drawing lines on a cylinder covered with graph paper? Have you always thought that low light levels in an exhibition area are just an economy measure or perhaps are intended to create a dramatic effect? Each of these, however, is evidence of preventive conservation.

Before looking more carefully at some of these aspects of preventive conservation, it is important to briefly consider the nature of the materials in our anthropological collections. Most of the specimens in a museum such as Field Museum consist of organic materials—that is, substances derived from plants or animals. This includes a wide range of materials: wood, bark, leather, skin, fur, hide, hair, bone, ivory, grass, seeds, and fibers of all kinds, to mention only the most obvious.

Most anthropological objects are impermanent. By their very nature, organic materials are not durable. The moment a tree or plant is cut down or an animal is killed, the natural processes of decomposition begin. While a plant or animal is living, dead tissue is constantly being replaced by new cells. This natural replacement of cells and tissue, however, ceases with death, and the wood, fiber, or skin immediately begins to deteriorate. This is all part of nature's great recycling scheme. Even if the wood is carved into a sculpture or the fiber is spun and woven into a blanket, this deterioration will take place. It may occur so slowly that it will not be readily visible, but it does occur.

For anthropological objects, there is the added problem that the people who made many objects never intended them to be permanent. Created for a specific ritual or function, these objects were later set aside or discarded. Since the mask maker, for example, was not concerned about his mask lasting beyond a specific ceremony, he felt free to use all manner of perishable materials, such as grasses, seeds, and skins, to create his mask. It is most unlikely that he was concerned about the problems he might be creating for some conservator in a far-off time and place. Once the mask becomes part of a museum collection, however, it is the conservator's job to make sure that the highly perishable materials contained in the mask endure for future generations to study and appreciate. Unfortunately, the conservator cannot completely arrest natural deterioration processes, but certain measures can be taken to slow down the inevitable.

With these considerations in mind, we can now look at some of the most important causes of deterioration found within a museum's exhibition areas: relative humidity, light, mounting and handling. (Deterioration of exhibited objects due to mold, insects, and other pests is also a concern for conservators. Since it is also a major concern in storage areas, this subject will be treated in a future article.)

Relative Humidity

Probably the most pervasive cause of deterioration to objects on display is the relative humidity within the building. Relative humidity is the percentage of moisture present in a given volume of air at a given temperature. Relative humidity, therefore, is closely interrelated with the temperature. For example, hot air can contain more water vapor than cold air. If the temperature goes up, but the moisture in that air remains constant, the relative humidity will go down; conversely, if the temperature goes down, the relative humidity will go up.

1. Water-soluble salt crystals growing on surface of a Greek lamp.

C. Sease

All organic materials contain a certain amount of water, some chemically bound, that is, chemically part of the material, and some loose within the cells. When an object made of organic materials is placed in a room, it immediately tries to reach equilibrium with the ambient environment by absorbing or releasing moisture. Once in equilibrium with its environment, the object will continue to absorb moisture and swell if the relative humidity increases and give back moisture to the air and contract if the relative humidity drops. This is a phenomenon familiar to anyone who has tried to raise or lower a stuck window in damp weather—it had been so easy during dry spells. In the museum, such seasonal changes in relative humidity can also cause damage to objects on display. In a basket, for example, many small breaks can occur as each element in the weave responds individually to changes in the relative humidity. In an object made of different materials or of joined pieces, free movement of individual pieces can be restrained, and cracking, warping, or breakage can result. Even objects made of pieces of the same material can be damaged in this way, as each piece can swell in a different direction, thus restricting the movement of adjacent pieces. Repairs sometimes contribute to this type of damage; areas of hard, dried glue can act as a restraint.

Abrupt fluctuations in the relative humidity, especially over a long period, can be even more damaging. At such times damage is the result of this same mechanical action on the object, but on a larger, more drastic scale. Once this damage occurs, it can never be undone.

More serious damage occurs when the relative humidity levels are not appropriate for organic materials. If the relative humidity is consistently very low, the object will first give off its loose, then its bound water, until equilibrium is reached. When this water loss takes place slowly and gradually, the object becomes desiccated, and consequently brittle. It will contract slowly, possibly warp and almost certainly split. Leather and natural fibers will become more rigid and lose their cohesion, thereby increasing the risk of breakage. Ivory and bone will crack, and ivory, if subject to enough stress, will eventually separate along its concentric laminations. Thin materials such as fibers and paper will become so brittle that the least amount of handling may cause them to break or disintegrate. Once an object's bound water is gone, it cannot be replaced and the resulting damage cannot be reversed.

Objects made of organic materials are not the only ones adversely affected by changes in relative humidity. Seemingly robust materials such as pottery and stone can be badly damaged indirectly by relative humidity changes. Archaeological objects frequently contain water-soluble salts from having been buried in the ground for long periods. These salts, mainly chlorides,

nitrates, and sulphates, are readily dissolved in groundwater and are then absorbed by any porous material buried in the ground. Pottery, stone, bone, and ivory are the archaeological materials which are most often contaminated with soluble salts. As soon as an artifact is excavated, these salts can begin to work their damage.

It is the job of the field conservator to deal with salt problems. If, for some reason, these objects do not get treated in the field, they will still contain soluble salts when they come into a museum. If they are kept in an environment where the relative humidity level is stable, they will remain in good condition. If the relative humidity fluctuates, however, considerable damage can occur. If the relative humidity level gets high enough, moisture in the air can cause the salts within the pot, for example, to go into solution. Later, if the relative humidity level drops, the moisture in the pot will evaporate, and the salts dissolved in it will crystallize out at or just below the surface. In badly contaminated material, a white bloom will first appear on the surface and slowly salt crystals will grow (fig. 1). In the solid, crystalline form, these salts have a larger volume than when in solution, so crystallization can exert great physical pressure against the object's undersurface. If the relative humidity fluctuates, the salts will go in and out of solution, changing in volume each time. In due course, this cyclic action will literally push off the surface of the object (fig. 2).

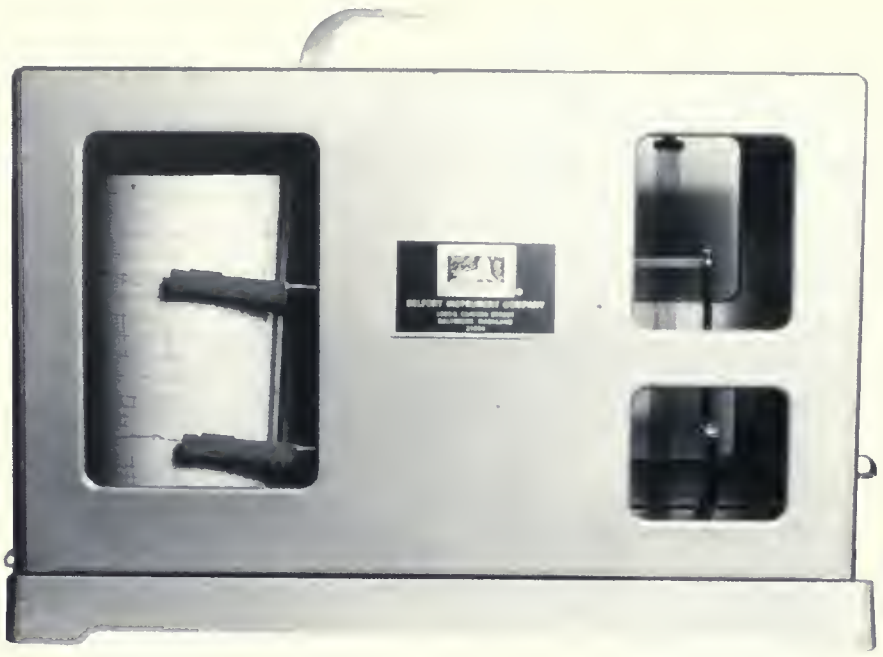
The problem of soluble salts can often be treated by soaking the object in successive baths of distilled water until the salts are removed. Some objects, however, cannot be treated in this way. Wood objects, for example, will not tolerate immersion in water. When removing the salts is impossible, the only remaining option is to control the environmental conditions.

Solving environmental humidity problems starts with monitoring the conditions in exhibition halls and cases. This is conveniently done with a recording hygrothermograph, a device for detecting and recording the relative humidity and temperature on a continuous graph (fig. 3). Such instruments are standard in museums throughout the world. In Field Museum, they can be seen in the exhibit cases in Webber Hall. Small dials are also used to indicate the relative humidity and temperature within a case, but these do not make a written record (fig. 5). You may also see in some cases small pink and blue paper cards; these contain moisture-sensitive dyes that indicate the relative humidity (fig. 4).

Once the relative humidity is known, there are various ways to adjust it to the desired levels, depending on the building structure, configuration of the exhibition halls, costs, and so forth. Air-conditioning systems can be installed to control the relative humidity and, on a smaller scale, humidifiers and/or dehumidifiers can be utilized to control individual halls or

2. Detail of a Peruvian ceramic figure. The surface on the top of the head has been pushed off by the action of water-soluble salts.

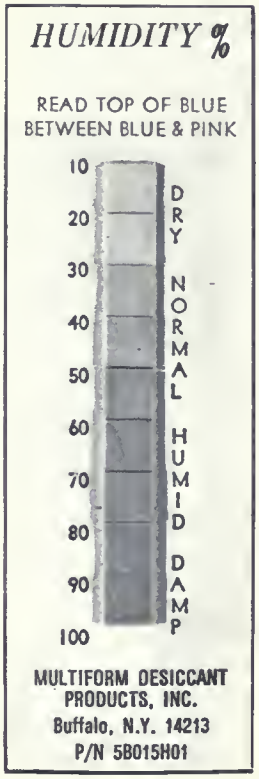
C. Sease



3. Recording hygrothermograph for monitoring temperature and relative humidity. This machine produces a written record; each chart records a week of readings.
C. Sease

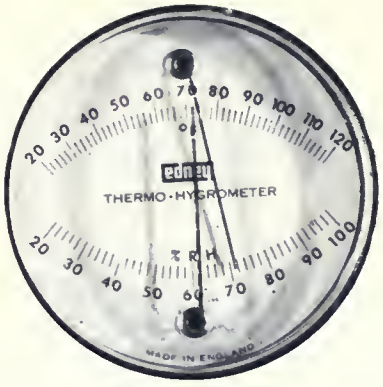
discrete areas. It is also possible to place the controlling mechanism within a case. Silica gel, a synthetic crystalline material that readily absorbs or releases moisture, is often concealed in museum cases to maintain the relative humidity within that case at a specific level. (Silica gel is the same material that manufacturers frequently pack in tiny containers along with moisture-sensitive consumer products, such as cameras.)

More often than not, a combination of the above methods is used to control the relative humidity within a museum. At Field Museum the entire building is air conditioned. Although air-conditioning helps to control the relative humidity, it still fluctuates considerably in the exhibition areas over the course of the year. This is not remarkable considering the size and configuration of Stanley Field Hall—an enormous space (more than 1.5 million cubic feet) that is almost impossible to control within strict limits, certainly the limits we are talking about for the proper care of organic materials. As well, many of our exhibition halls are themselves large spaces that open onto Stanley Field Hall. Since these are not self-contained spaces, they are difficult to control. The newly reconstructed exhibition hall where *Gods, Spirits and People* is on display, however, is a self-contained area with its own air-conditioning system capable of maintaining a set level of relative humidity. Since most objects in the exhibit are made of organic materials, the relative humidity is kept at 50 percent for the current exhibition. Visitors



Sophia Anastasiou-Wasik A110532

4. Paper card using pink and blue moisture-sensitive dyes to indicate relative humidity.



Sophia Anastasiou-Wasik A110533

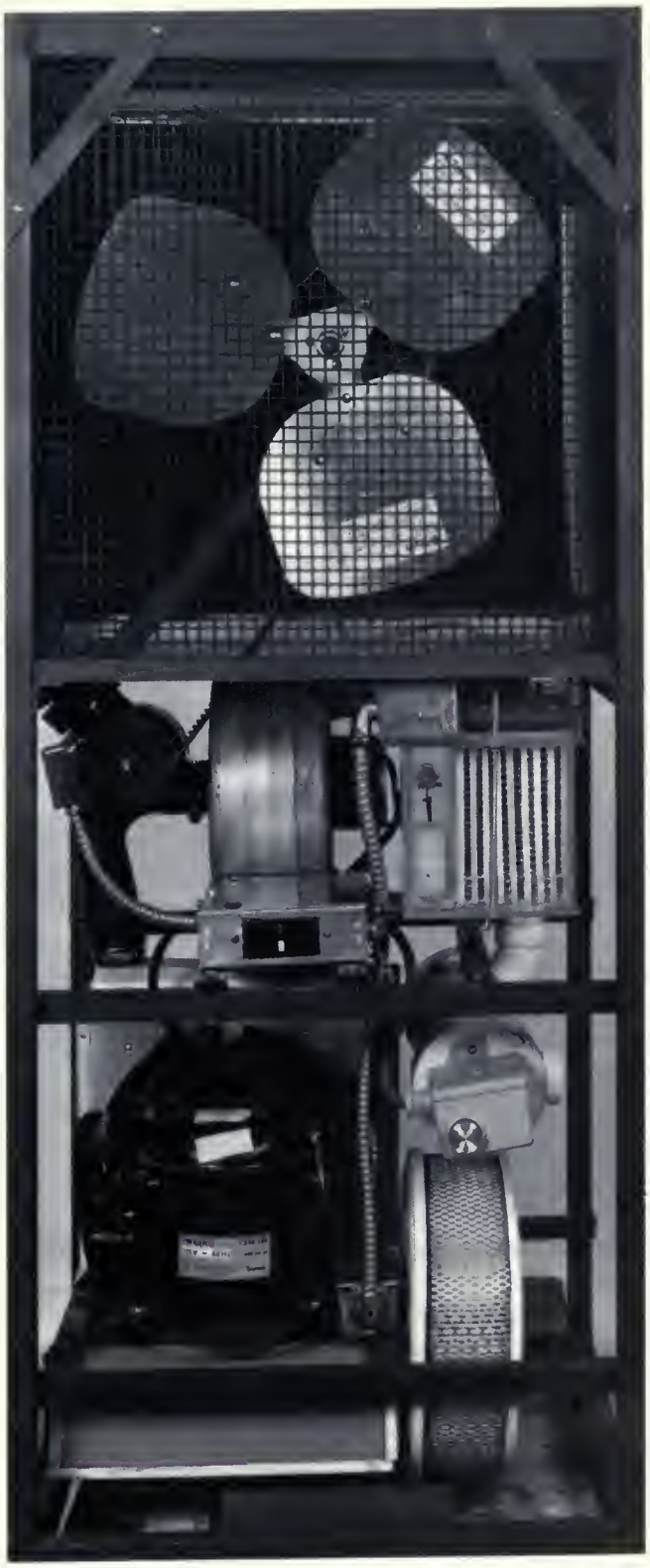
5. Dial thermohygrometer for monitoring temperature and relative humidity.

to this hall frequently comment on the area's high humidity level. In the past, room humidifiers have been used to control relative humidity in exhibition areas—in 1984, for example, for the *Treasures of the Shanghai Museum* show. We are now in the process of developing a new exhibit, *Rearing Young* (scheduled to open mid-1988), that will utilize silica gel within the cases to protect the objects on view.

In addition to all of these relative humidity controls in use at Field Museum, an exciting new development is currently underway in Webber Hall. We are in the process of developing a relative humidity module that promises to be an important contribution to the technology available to the entire museum community. In essence, the module is a small-scale mechanical control system that provides low cost relative humidity control for enclosed spaces (fig. 6). The Webber Hall module, which visitors can view through a window, is set to produce a level of relative humidity between 40 and 60 percent. A single module can control several cases, the deciding factor being the total volume of air in the cases. A large plastic tube extends from the output of the module; smaller tubes branch off it to enter each individual case. We continue to refine the module and will use several in the new Egyptian and Pacific halls, now being reinstalled.

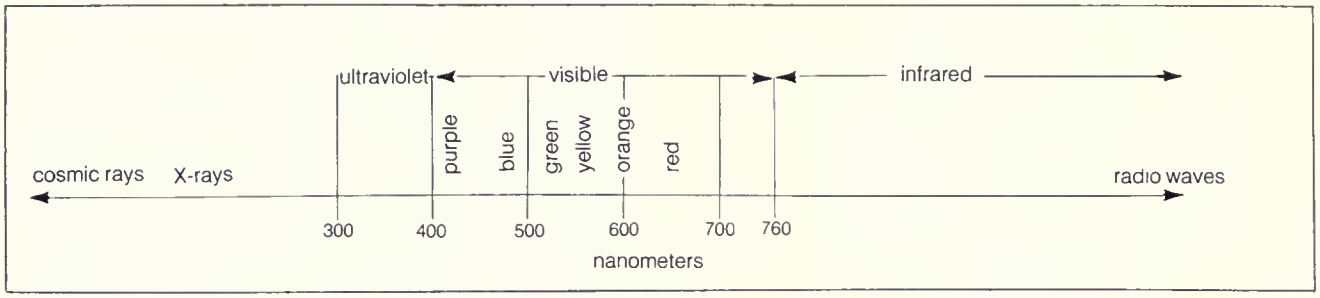
Light

Light is also a major cause of deterioration of organic materials. Light is actually a form of radiation, a form that we can see; other forms of radiation are not visible to the human eye. We are all familiar with the way a prism will break up daylight—or white light emitted by tungsten and fluorescent lamps—into all the colors of the rainbow. Each of these colors has a different frequency, or wavelength. The wavelength of light is



Sophia Anastasiou-Wasik 84983

6. Relative humidity module currently visible in Webber Resource Center.



7. The Wavelengths of Visible and Invisible Radiation

shortest at the purple end and longest at the red (fig. 7). Beyond visible light at the short-wavelength end lies ultraviolet radiation, while beyond the red at the long-wavelength end lies infrared radiation. All of these are emitted to various degrees by daylight and white-light sources.

Damage caused by light to organic materials is related to wavelength. Ultraviolet radiation, that is, short wavelength radiation, is very potent. It will cause more damage to museum objects than the same amount of blue radiation (light) which, in turn, will cause more damage than orange radiation (light). Even though ultraviolet radiation is more potent, there is more visible radiation emitted by all white-light sources. Therefore, the greater quantity of visible radiation can be as destructive as ultraviolet. For this reason, it is difficult to say conclusively that one is more damaging than the other. We must take measures, then, to control both visible and invisible light in a museum exhibit.

Since light can damage only what it reaches, its major effect is surface deterioration, most objects being opaque. The most obvious effect of light damage is fading. We are all familiar with fading that occurs in curtains, upholstery fabrics, or brightly colored rugs placed by windows. The same effect is seen in textiles and costumes in museum collections if they are exposed to strong light. The woven mat shown in figure 8 was on display in the African Hall for over 25 years. It was attached to the wall of a case with one side exposed to light from the case and hall. The other side, tight against the wall of the case, was shielded from all light. Recently removed from display, the side exposed to the light is now all one light color. Originally, it was decorated with an elaborate purple design still visible on the back of the mat overlying the faded side on the left of the photograph. Pigments on painted objects will also fade in strong light, as will feathers, with some colors more likely to fade than others.

The tensile strength of organic materials can also be damaged by light, and such damage is not always immediately visible. Light can cause the molecular chains of the components of organic materials to break into shorter units. When this happens in wood, for example, the structural damage will be limited to exposed surfaces, resulting in discoloration and bleaching. In thinner, more delicate materials, such as fibers, fur, or hair, more radical change, discoloration, embrittlement, and disintegration, can result.

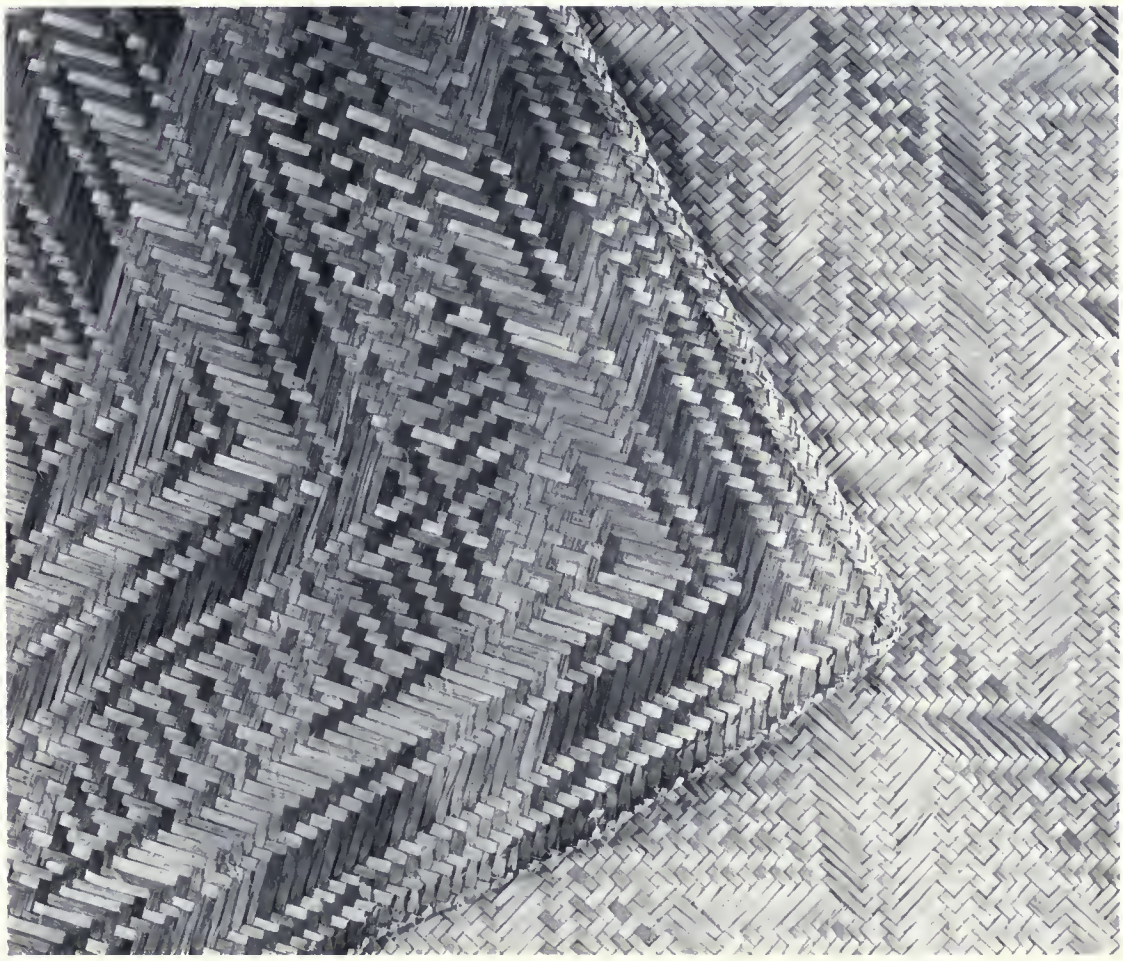
The important thing to remember about damage from light is that it is cumulative. Exposure to small amounts of light over a long period can be just as damaging in the long run as short periods of intense exposure; damage caused by light, then, is directly proportional to intensity and duration of exposure. As well, damage due to light is not reversible. Once a textile has faded, a piece of wood has become bleached, or a fiber embrittled, it cannot be restored to its original color, luster, or strength.

To protect objects from such effects, the light levels within an exhibition hall must be carefully controlled. Obviously, controlling light levels is far simpler than controlling relative humidity levels. It remains a complex task, however, since exhibition lighting involves visual and aesthetic considerations, as well as technical expertise.

The first step in controlling light levels in a museum is to eliminate all daylight. This is done both for design and conservation reasons. The amount and quality of available daylight changes greatly during the course of a day and over the year, making it unreliable for exhibition purposes. More important, however, is the fact that daylight can be very harmful to a wide range of museum objects. There is a higher proportion of ultraviolet light in daylight, something on the order of six times more than that emitted by incandescent light, so daylight must go.

Once the daylight is removed, it is then necessary to control the artificial light used in lighting an exhibition. Ideally, objects made of organic materials should be kept in the dark, so we must try to achieve a compromise between the level of light necessary to display an object adequately and the level needed for its preservation.

Most often, light levels are worked out by the exhibit designer to achieve an overall effect, with consideration being given to specific light levels for organic materials. Field Museum's Hall 10 *(Maritime Peoples of the Arctic and Northwest Coast)* provides a good example of this approach. Virtually every object in every case in Hall 10 is sensitive to light; therefore, the light levels are kept quite low. In addition, a mechanical device is used that is, to my knowledge, unique to Field Museum. The case lights are activated by pressure sensitive pads concealed underneath the carpet. As a visitor approaches a case, its lights grow brighter; they become dim again as soon as he steps away. In this way, the overall light levels are kept very low at all times except when viewers are actually present.



Sophia Anastasiou-Wasik A110534

8. Woven mat from Madagascar showing fading (right side of photograph) from light. Cat. No. 185113.

Artificial light can be controlled in various ways. When an exhibit contains only a few light-sensitive objects, a common practice—especially for books and manuscripts—is to cover the vitrines, or panes, of their cases with cloth, much as bird cages are covered at night. When one wishes to see into the case, the cover's front panel is rolled up. For a group of light-sensitive objects, a more expedient protection method might be to isolate them in an exhibition area where the light levels are kept low. This is more difficult than it may at first seem. If the difference in light levels is too great between adjacent areas, allowance must be made for the visitors' eyes to adjust to the change. This requires both space and time.

The kind of artificial light used is also a concern of the conservator. The most common artificial light used in museums is incandescent, also called tungsten, and fluorescent. Modifications of these and new types are

9. Hopewell stone pipe shown with its brass mount. Note that all but the end of the brass (on the right) has been covered with plastic tubing. Cat. No. 56750.
Sophia Anastasiou-Wasik A110535

being developed, but at the moment these two are the most cost efficient. Tungsten bulbs—the type of light in most common general use—come in a myriad of sizes and shapes, from the conventional domestic light bulb to floodlights. Such lamps emit a small amount of ultraviolet light; but, since this invisible light is of very short wavelength, it is extremely harmful. Tungsten lamps, however, are covered in a glass bulb which successfully blocks out this ultraviolet light. Tungsten lights, therefore, are safe to use in exhibition areas with only a glass filter in front of them to filter out all ultraviolet light.

Fluorescent tubes, on the other hand, emit large amounts of ultraviolet light. In order to use such a light source safely with light-sensitive organic materials, it is necessary to use it in conjunction with ultraviolet-absorbing filters. These filters have no effect on the amount or quality of visible light passing through them, but do prevent the transmission of all ultraviolet light. Made of various kinds of plastic, these filters come in many different forms, the most common being 1) acrylic sheets that can be used in place of glass for windows or the vitrines of cases; 2) acrylic sleeves that fit over fluorescent tubes; 3) thin foil that can be cut to shape and adhered to glass; and 4) varnish. At Field Museum, we use the acrylic sleeves extensively as most of our cases are illuminated with fluorescent tubes. The thin foil is also used to block out the ultraviolet light from the windows in the Grainger Gallery (South Lounge). Future installations will incorporate these and newer methods of lighting.

Handling

Most museum visitors are well aware that objects in an exhibit should not be touched, but they seldom realize why. There are two main reasons why handling is bad for objects.

The skin on our hands naturally secretes salts, oils, and acids that are harmful to objects. The surfaces of objects that are continually touched will rapidly become dirty and greasy from the oils and dirt on one's hands. Sometimes, these surfaces are difficult or impossible to clean, and such soiling will necessitate risky cleaning procedures. As well as soiling objects, these salts, oils, and acids can promote the deterioration of objects. Acids, for example, on fingers will leave fingerprints on objects that can etch the surfaces of polished metals or remove the patina from oxidized surfaces. Extensive handling over time can result in the active corrosion of metal objects. When it is necessary to handle specimens, museum staff take precautions such as wearing cotton or plastic gloves.

In addition to damage caused by the secretions of our skin, handling can also damage objects by simple wear and tear. Just as the upholstery on the arms of chairs in one's home can be worn thin over a period of many years, so can museum specimens be damaged by casual touching. The cumulative effect of touching over long periods can be devastating. The crispness of sculptural detail may be gradually lost as it becomes rounded; textiles may be rubbed thin; gilded, painted, or patinated surfaces may be lost forever. Generally, objects are placed inside cases to safeguard them from

touching, as well as to keep them clean. Enclosing objects also enables us to use the enclosed space to control the environment around the object, if necessary, to protect it from relative humidity and light.

Mounting

Within exhibit cases, further protection for museum objects is provided by the mounts—custom-made supports that position objects for viewing. The mount also serves an important protective function: it supports the object securely so that it cannot fall or break if the case is jostled (fig. 9). It also prevents stresses from being focused on thin, weak areas and inhibits any possible distortion of the object that could lead to deterioration. In order to accomplish these objectives, a mount must be carefully designed. The weak areas of the object must be identified and its general condition assessed before a mount can be made. A fragile textile, for example, may be unable to support its own weight when hung vertically, so a special mount will be needed to display it horizontally or slightly inclined in order to evenly distribute the textile's weight. Making mounts is a time-consuming job that requires great patience and skill; the resulting mounts can frequently be works of art in themselves.

Mounts are made out of a wide variety of materials, depending on the object to be mounted. Most anthropological objects at Field Museum are mounted with rods, clips, and brackets made of plastic or brass. Other useful materials for mounts are cloth, acid-free tissue, and certain kinds of plastic foams. Mounts that are in direct contact with an object must be made of inert materials that will not interact with the materials of the object to cause deterioration. Wherever brass mounts come in contact with an object, the brass is covered with felt or tubing made of inert plastic (fig. 9). This tubing insulates the brass from any other metal on the object, preventing corrosion that would occur if the two metals were in contact. This tubing also serves to cushion the brass against the surface of the object. Special acid-free tissue is used to stuff hollow three-dimensional objects while mannikins and dress forms are fashioned out of plastic foams. Only a few kinds of plastic and plastic foams are suitable for mount making: those that do not give off harmful vapors.

Mounts must be carefully constructed so that they will hold the object firmly; but they must not scratch, abrade, dent, or otherwise deface an object. Neither must they exert any undue stress or tension on the object. For example, small, but wide plastic clips are used to attach large, flat objects vertically to a wall. Gentle tension at numerous points around the perimeter of the object holds it firmly in place. Such a mounting technique prevents any stretching and ripping of the object that might be caused by its own weight.

Mounts for organic materials are especially tricky. In discussing the ways in which organic materials respond to fluctuations in relative humidity, it was noted how such materials change in size and shape over the course of time while absorbing or giving off moisture. Such movement must not be inhibited by any mount or warping, cracking, and breaking can easily result. For this reason, some objects are cradled on a plastic mount with small brass pins loosely holding them in position. These and other mounting devices are particularly evident in Hall 10.

These are the major issues that concern an exhibition conservator. Other aspects of conservation are concerned with these and additional issues and will be explored in future articles. **FM**

Anthropology Symposium for Collectors

Very often private collectors approach Field Museum for information and help with objects in their possession. Our staff can help with some problems and not with others, and we thought that collectors might find it useful and informative to participate in a symposium with Museum Staff about collector's problems.

On Saturday, March 26, from 9 to 12 am, in Lecture Hall I at Field Museum, the Collector's Committee of the Capital Campaign and the Department of Anthropology will present a panel discussion of assistance for collectors. Members of the Anthropology staff will talk about conservation, cataloguing, documentation, collection storage, and display, ethical and legal problems.

Field Museum staff is qualified to speak only about its kind of collections, ethnographic, archaeological, and Oriental art objects, but obviously not about European fine art, historical antiques, European musical instruments, and similar material. These are all matters which are dealt with every day at Field Museum, and perhaps experience gained by the Museum staff in dealing with its collections may be helpful to collectors in dealing with their collections. The duration and format of the meeting will not lend itself to bringing specific objects in for discussion. Phone inquiries and reservations should be made to 322-8862.

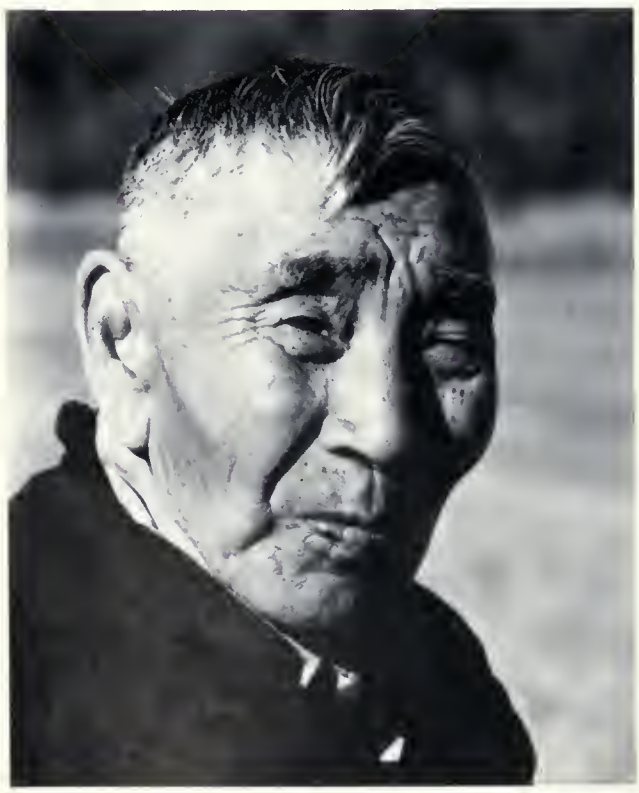
John A. Kakaruk
Painter of Inland Eskimo Life

by Charles V. Lucier *and* James W. VanStone

Although there are no words for "art" or "artist" in the Eskimo language, art has always been an important part of Alaskan Eskimo life. The graphic tradition, as opposed to carving in the round, has been almost exclusively a characteristic of the Inupiat* Eskimos who live north of Norton Sound, some of whom moved south to the Yupik-speaking region of St. Michael in the mid-19th century (fig. 2).

The earliest Eskimo graphic art consisted of incising or engraving on small objects of walrus ivory or caribou antler. Prehistorically this engraving was usually done by men on harpoon heads, tools, and personal ornaments. Engraving in ancient times were of a decorative or perhaps magical kind, or were marks of ownership. In the early 19th century, fine realistic engravings were done typically on tobacco pipe stems, drill bows, and bag handles. These engravings sometimes commemorated special events, such as the killing of walrus or whales, but many were the creation of artists for esthetic effect. Also among Inupiat, who lived in a kind of meritocracy, demonstration of superior skill was an important ingredient of leadership and evidence of higher social status: the more an individual could do well, including "art," the better for himself and his family. In the middle to late 19th century, engravings were made less for use at home and more for ethnographic collectors or as souvenirs to be sold or traded to commercial whalers, government officials, gold miners, and missionaries, who came to Alaska in large numbers after 1850.

1. John Azialuk Kakaruk in 1970 (photo by Charles V. Lucier, 110436).



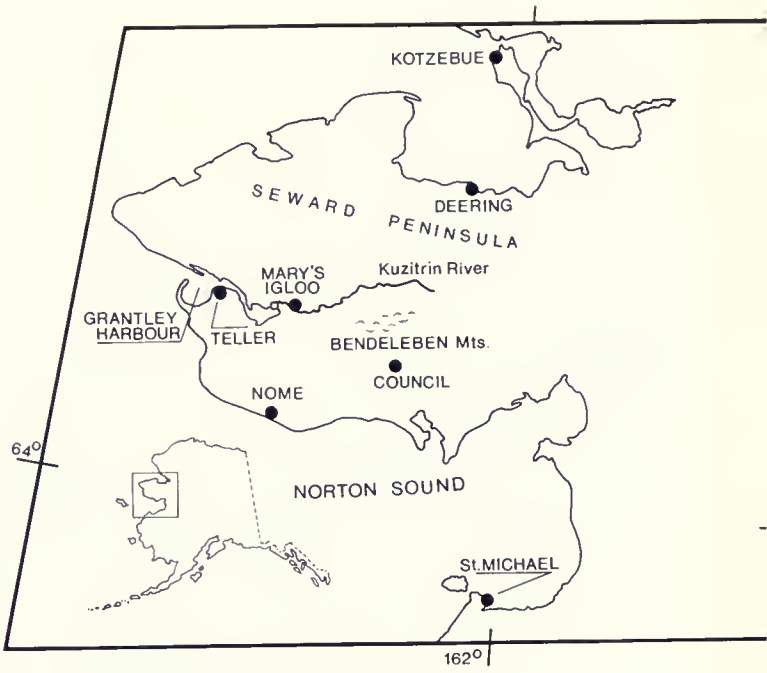
European explorers in northwest Alaska were impressed with the ability of Eskimos to recognize objects in two-dimensional illustrations, but exposure to western illustrations became common only after the first commercial whaling ship sailed through Bering Strait in 1848. Eskimos were frequently given pencil and paper to draw pictures and maps. With the establishment of schools in northwest Alaska, non-ivory graphic art by Eskimos increased. Drawing classes were frequently part of the curriculum in the early schools, since pupils and teachers could not speak each other's languages. The Rev. Sheldon Jackson, a Presbyterian

*Inupiat is the name of this Eskimo group. Inupiaq, used later in this text, is the adjectival form.

Charles V. Lucier is a retired biologist, formerly with the Alaska Department of Fish and Game; James W. VanStone is curator of North American archaeology and ethnology at the Field Museum.

missionary and the first agent of education in Alaska, published a number of pencil and ink drawings by unidentified Eskimo artists in official government reports. Two of these drawings are reproduced here. In the first (fig. 3) hunters are shown hunting ducks or geese with a bolas (rope with weights attached for throwing). The hunter at the left has just released the weapon toward a flock of low-flying birds. On the right a hunter runs toward a bird entangled in the cluster of bolas weights. The second drawing (fig. 4) depicts the use of reindeer as draft animals (for additional 19th-century Eskimo drawings, see Field Museum *Bulletin*, vol. 53, no. 6, June, 1982).

One of the earliest identified Eskimo graphic artists was Guy Kakarook from St. Michael, who drew and painted 64 pictures of scenes and activities around his home village and on the Yukon River. Very little is known about Kakarook. He was born east of Nome in the mid-1800s and later moved to St. Michael, where he worked as a deckhand on river boats ascending the Yukon River with gold miners headed for the Klondike. He is believed to have died in Nome sometime after 1905. Kakarook used watercolor for buildings, boats, and people, and crayon for sea and sky, often combining the two media for hills, grass, trees, and other natural features. He signed his name to his paintings,



2. Seward Peninsula and Adjacent Areas

but did not date or identify them. These paintings, which provide a valuable pictorial history of St. Michael and the Yukon River in the 1890s, were collected by Sheldon Jackson and are now in the National Anthropological Archives, Smithsonian Institution.

3. Hunters hunting ducks or geese with a bolas (Jackson, S. Report on Introduction of Domestic Reindeer into Alaska,... 1884. Washington, 1895).

4. Reindeer hauling freight (Jackson, S. Report on Introduction of Domestic Reindeer into Alaska,... 1884. Washington, 1895).

5. Eskimo duck hunter (Smithsonian Institution, photo no MNH 1713C).

Typical of Guy Kakarook's style and subject matter is a painting that depicts an Eskimo duck hunter seated by a tundra pond, pulling on a pair of sealskin waterproof boots. He has already killed two ducks with his spear and two more are struggling in baleen snares set between two points at a narrow area of the pond. A pair of swans are flying overhead. The pale colors are brown for the hunter, brown and green for the tundra, and blue for the sky and water (fig. 5).

A modern Eskimo graphic artist whose name and style of painting is similar to that of Guy Kakarook and who was born on Seward Peninsula at the time Kakarook was producing his art, is John Azialuk Kakaruk, born near Deering in 1892 (fig. 1). Despite the similarity in their names, there is no definite evidence that the two artists were related.

John A. Kakaruk spent his early years at Mary's Igloo and Council in interior Seward Peninsula, where his father hunted, fished and trapped, and worked for gold miners. As a youth and young adult, John worked as a reindeer herder, these animals having been introduced from Siberia in 1892, the year of his birth. Later, in the 1930s, Kakaruk worked summers as a member of gold dredge crews on Seward Peninsula. In the early postwar years he was employed as a handyman and watchman at the Lost River tin mine on the coast west of Teller, where he associated with other older Eskimos from Kotzebue and elsewhere who shared his interest in traditional Eskimo culture, especially music, dancing, and storytelling.

One of the most memorable events of John Kakaruk's middle years, which he recalled with enthusiasm, was his employment by an MGM movie crew which over-wintered aboard a schooner in Grantley Harbor on Seward Peninsula while filming sequences of the movie "The Eskimo" in the early 1930s. John provided and controlled a herd of reindeer that formed a backdrop for a scene showing two supposed shamans in a drumming duel. John often mentioned the Danish explorer Peter Freuchen, who served as a technical advisor for the filming.

Sometime in the 1950s John moved with his extended family to the Red Devil mercury mine on the Kuskokwim River and later, in 1959, to Anchorage where Lucier first met him in the fall of that year. In the early to mid-1960s he and his wife Alice danced regularly for visiting tourists at "The Gilded Cage," an Alaska Crippled Children's Association gift shop and tourist center in downtown Anchorage. He also attended meetings of the Cook Inlet Native Associa-

6. Inupiaq youth hunting snowshoe hares 110362

7. Two boys hunting snowshoe hares 110361

tion, a multi-cultural native organization headquartered in Anchorage, and later participated in dancing and other social activities of Urban Natives United, another native organization in the city. He died in Anchorage in 1981.

Although resident in a large city during his later years, John Kakaruk's inner life was linked to his grandfather's and father's caribou hunting and fishing existence. In 1960, at the age of 68 and at the request of Lucier, he produced a series of ink and watercolor sketches on drawing paper that illustrate the subsistence life-ways of traditional Inupiat on inland Seward Peninsula, specifically the Kuzitrin River drainage, in the late 19th century. Seven of his sketches are reproduced here to illustrate his realistic style and the range of his subject matter.

Figure 6. A winter or fall scene showing an Inupiaq youth pushing a light inland sled on which are dead, snared snowshoe hares he has collected from snare sets. At the left, two dead hares are hanging by their hind legs from willow branches. In the center is a dead, snared hare in a tripped counterbalanced set. Behind the sled a ptarmigan or hare snare is shown in a constructed cut willow "fence." The hunter's parka is brown, his pants reddish brown, the hares off-white, and the sky blue-green.

Figure 7. Two boys are driving snowshoe hares into a set net in willows or cottonwoods. One boy has a bow and arrows, while the other holds a stick for clubbing the hares caught in the net. Both parkas are fawn-colored. The older boy at left wears light tan pants and grey boots; boots of the boy at right are yellowish. The hares are white and the sky blue-green and yellow.

Figure 8. A summer or fall scene showing a kayak hunter on an inland lake using a throwing board with a multi-pronged spear to hunt ducks. One speared duck is in the water. Note that the hunter has both single- and double-bladed paddles. The lake is pale green, the hunter's parka light tan, and the kayak a darker tan. The mountain sides are various shades of brown, with white snow banks, and the sky tan-streaked.

Figure 9. In this mid-winter scene a hunter on snowshoes is shown visiting his hare and ptarmigan snare sets. At the left, a snared snowshoe hare hangs from a counterbalanced snare set in a hare trail. To the right is an untripped hare or fox snare. In the foreground are snared ptarmigans caught in small snares baited with willow branches. In the background are the Sawtooth Mountains in the Kuzitrin River drainage. The hunter's clothes are tan and boots yellow-ocher; ptarmigans and hare off-white, and sky streaked green-yellow.

Figure 10. An inland village scene showing a fisherman beside cut fishing holes on the frozen Kuzitrin River. The Sawtooth Mountains are in the background. In his right hand the fisherman holds an ice

8. Kayak hunter on an inland lake 110354

9. Inupiaq hunter visiting his hare and ptarmigan snare sets 110356

10. Inland village scene 110353

11. Inupiaq bear hunter 110352

12. Inupiaq reindeer herder with sled and deer 110438-16

scoop for removing slush ice from the holes. A fish line and lure are at his left. The two fish on the ice are probably trout or grayling. Behind the fisherman on the bank is a sod-covered winter dwelling with a small storm shed and central roof skylight and smoke hole. To the left of the house is a raised storage cache and a sled. Small cottonwoods or willows, typical river bank vegetation, are also shown. The fisherman's parka is amber, pants yellow-brown, and boots whitish. The two fishing holes are blue-green, the sky streaked green; cache contents cover and door and rooftop of house are tan.

Figure 11. An Inupiaq hunter with a spear, bow, and arrows is about to attack a female brown bear with her half-grown cub. The Sawtooth or Bendeleben Mountains are in the background and small cottonwood trees are shown in the foreground. The sky is streaked blue-green, the mountains outlined in black. The hunter's parka is streaked yellow-pink, probably to represent ground squirrel pelts. The mother bear is dark brown, the cub black-brown.

Figure 12. An inland Inupiaq reindeer herder with a sled pulled by a single deer. The sled is the typical Inupiaq variety rather than the Siberian type, with curved antler stanchions and narrow runners curved in front, usually used with reindeer; unfortunately the colors used in this sketch are unavailable. Two Siberian style sleds are shown in figure 4. (For more detailed information concerning the harnessing and driving of reindeer, see the *Bulletin*, vol. 53, no. 6, June, 1982.)

Like his late 19th-century predecessors, John Kakaruk was an untrained artist. Although not as good a draughtsman as Guy Kakarook and the unknown artists whose work is shown in figures 3 and 4, his landscapes show the same accurate perspective that conveys the vast depth of space characteristic of the western Alaska tundra. Unlike Kakarook, however, his human and animal figures are not often drawn to scale nor is he as sophisticated in his use of colors.

John Kakaruk's early life as a reindeer herder was, in many ways, a continuation of the life-ways of previous generations of caribou-hunting inland Inupiat. Although he later worked for wages and World War II broke his attachment to inland life, he retained his sense of traditional values. John Kakaruk's art reflects a concentration on his homeland and on the subsistence life-ways of Inupiat culture even though, at the time these drawings were made, he had lived for a long time in a modern urban setting. **FM**

Suggested Readings

Ray, D.J.
1969 Graphic Arts of the Alaskan Eskimo. U.S. Department of the Interior, Indian Arts and Crafts Board, Native American Arts 2. Washington.
1971 Kakarook, Eskimo Artist. *The Alaska Journal*, vol. 1, no. 1, pp. 8-15.

1. The diorama in "Plants of the World" (Hall 29) at Field Museum showing *Welwitschia mirabilis* in its natural habitat. The plant in the left foreground shows the female reproductive structures while that on the right shows the small clusters of male "flowers" (compare figs. 8 and 10). 80265

WELWITSCHIA THE WONDERFUL

Life as a Survivor In the Desert of Southwestern Africa

by Peter R. Crane *and* Catherine D. Hult

IN THE AGE OF GENETIC ENGINEERING and satellite surveys of the earth's vegetation, it is easy to forget the appalling incompleteness of basic knowledge about plants and their ecology in so many parts of the world. Even today, the discovery of new plant species either of exceptional scientific interest or potential utilitarian value is not a rare event as collectors and specialists from major museums and universities pursue their fieldwork in the tropical regions of the world.

In the late nineteenth century, however, botanical discovery was proceeding even more rapidly—in fact at an extraordinary rate, as an upsurge in man's

scientific inquisitiveness coincided with the geographical exploration of the remote areas of old colonial empires. As the vast extent of the world's botanical richness gradually became known, it did much to stimulate Darwin and others who were striving to account for the origin of biological diversity, but it also fascinated a broader botanical and general audience by bringing forth some of the most bizarre and unusual plants known to science.

Such discoveries included *Victoria amazonica,* a tropical water-lily from South America with giant floating traylike leaves more than six feet across, and *Rafflesia arnoldii,* a stemless, rootless parasite with monstrous red-purple, fly-pollinated flowers over three feet in diameter and with the visual and olfactory impact of a rotting carcass. Equally bizarre, and botanically still more remarkable is *Welwitschia mirabilis,* a keystone in our understanding of plant evolution which first became known to science in the same year that Darwin's *Origin of Species* changed forever our perception of the natural world.

In 1859 the Austrian botanist and physician, Dr. Friedrich Martin Joseph Welwitsch (1806-72), was exploring the vegetation and plants of Angola, in southwestern Africa. Welwitsch (fig. 2) had already established a reputation as one of the foremost collectors of African plants and was in contact with some of the most eminent European botanists of his time. As a result of his travels, large numbers of new species were discovered and specimens were sent back to Europe for study at major botanical institutions. Like many collectors before and since, he taxed his health to the limits, and "still suffering from the effects of fever,"[1] he left his base in Louanda (Luanda) at the end of June 1859 to explore the vegetation along the coast of southwestern Africa in the vicinity of Mossamedes (now Namibe). As he later recorded, "The magnificent climate of Mossamedes was so delightful, and so speedily restored my shattered health, that after a stay of five weeks I had quite recovered and felt myself a new man. I therefore extended my excursions further and further — first northward, and southward along the coast to beyond Cape Negro and Port Alexander. . . ."[1]

It was south of Mossamedes that Welwitsch first encountered the remarkable plant which now bears his name. On returning to Louanda, he described his discovery in a letter to Sir William J. Hooker, then director of the Royal Botanic Gardens, Kew, in England. "Several miles before reaching Cape Negro the coast rises to a height of about 300-400 feet, forming a continuous plateau, extending over six miles inland, as flat as a table. This tabular elevation. . . is. . . clothed with a vegetation which, though scanty, consists of plants of the highest interest; among them a dwarf tree was particularly remarkable which, with a diameter of stem often of 4 feet, never rose higher above the surface than 1 foot, and which, throughout its entire duration, that not unfrequently might exceed a century, always retained the two woody leaves which it threw up at the time of germination, and besides these it never puts forward another. The entire plant looks like a round table, a foot high, projecting over the tolerably hard

2. Dr. Friedrich Martin Joseph Welwitsch, from a photograph taken in August 1865.[8] Welwitsch was born on February 5, 1806 in Maria-Saal near Klagenfurt, Austria but for most of his professional life worked for the Portuguese government. Such was the importance of his collections from southwestern Africa that after Welwitsch's death (Oct. 20, 1872) the government of Portugal filed suit (Dom Luis the First, King of Portugal, *versus* Carruthers and Justen) in a controversial and unsuccessful attempt to recover the Welwitsch specimens from the British Museum (Natural History). GN85011

Peter R. Crane is associate curator of Paleobotany and Catherine D. Hult is a laboratory assistant in the Department of Geology.

3. Sir Joseph Dalton Hooker F.R.S. (1817-1911). J.D. Hooker was one of the foremost scientists of the Victorian era and served as director of the Royal Botanic Gardens, Kew, England from 1866 to 1885. He prepared the first detailed scientific description of *Welwitschia* and named the plant after its discoverer. The Bettmann Archive

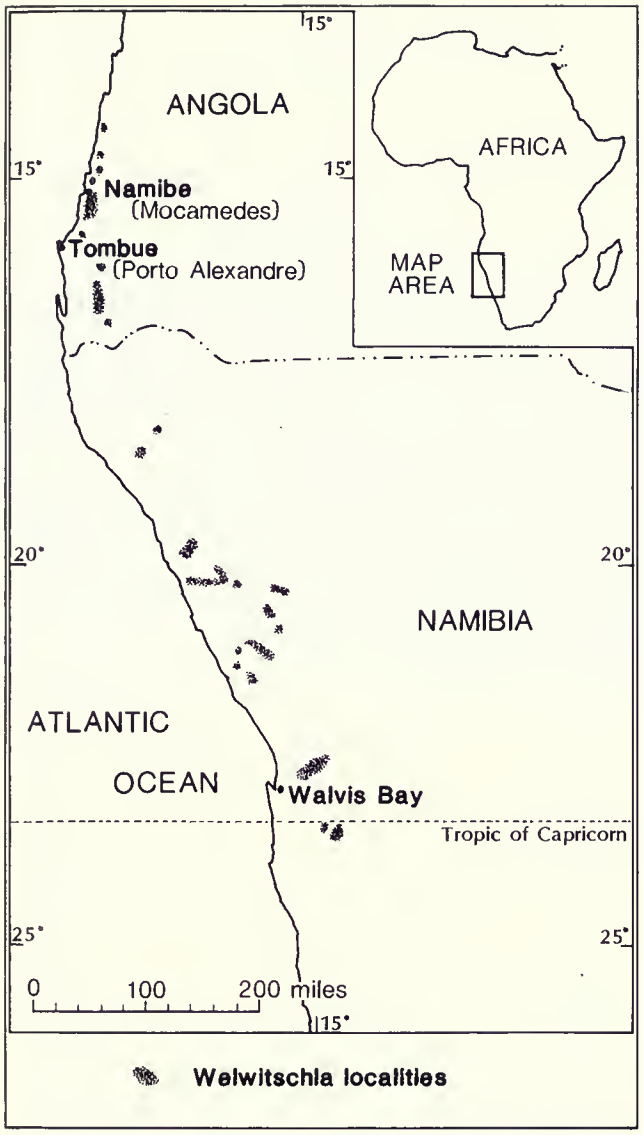
sandy soil; the two opposite leaves (often a fathom [6 feet] long by 2 to 2½ feet broad) extend on the soil to its margin, each of them split up into numerous ribbon-like segments."[1]

At the Field Museum we are uniquely fortunate to be able to personally experience something of Welwitsch's surprise and fascination at his discovery without having to endure the hardships of the southwest African desert. The accurate and dramatic reconstruction of *Welwitschia* in "Plants of the World" (Hall 29) shows several plants in their native habitat looking as one author expressed it "like stranded octopuses"[2] on the bare desert surface (fig. 1).

Welwitsch continued his letter to Hooker with a few more details and half a page of description in Latin. His reputation as an accomplished botanist combined with his seemingly fantastic description was sufficient to set the European botanical world buzzing when Welwitsch's letter was read before the Linnean Society in London on January 17th 1861, and subsequently published. As Hooker's son later described, "...since the discovery of *Rafflesia Arnoldi*, no vegetable production has excited so great an interest...."[3]

In the autumn of 1861, even before specimens from Welwitsch arrived in London, further information was forthcoming about this extraordinary plant. By a remarkable coincidence, a box arrived at Kew from Damaraland (now part of Namibia) containing several plants collected by an English botanical artist, Thomas Baines. Quite independently the material had been collected in an area about 500 miles south of that visited by Welwitsch, and among the specimens were a few *Welwitschia* cones along with the first drawings of complete plants. Transport of the specimens from the Namibian Desert to London had taken almost six months and although they were largely rotten on arrival, they were studied by Dr. Joseph Dalton Hooker shortly before he succeeded his father, William, as director of the botanical gardens at Kew (fig. 3). In spite of their poor condition, Hooker quickly established that the seeds of *Welwitschia* were more like those of cycads than flowering plants and thus that the plant was of exceptional botanical interest. This was sufficient to start J. D. Hooker upon a year of intensive work, which still stands as one of the classic studies of this bizarre plant. Rapidly he procured more specimens, not only from Welwitsch, but also from other correspondents in southwestern Africa, and began his investigations in earnest.

Judging from his prodigious work in many areas of botany as well as from insights into his personality provided by his correspondence,[4] Hooker must have been a man of extraordinary energy. In letters to his friend Charles Darwin, Hooker mentions several long five-hour sessions at the microscope studying the finer details of *Welwitschia*. With an eye to his own meticulous labors on an equally peculiar group of organisms, Darwin commented, "I see plainly that *Welwitschia* will be a case of barnacles."[5] Hooker was evidently fascinated and excited by the intricacy and botanical implications of *Welwitschia*'s structure. Describing his work to Thomas Henry Huxley, another of his illustrious contemporaries in Victorian biology, he bubbled with enthusiasm asking Huxley to imagine an embryo, "expanding like a dream into a huge broad woody brown disc...of texture and surface like an overdone loaf.... It is without question the most wonderful plant ever brought to this country—and the very ugliest."[4]



4. The natural distribution of *Welwitschia mirabilis* in southwestern Africa (redrawn by Clara Richardson from a map compiled by Kers[9]).

Yet, as his work neared completion, Hooker experienced the inevitable frustration and staleness that comes in the final stages of any long project. Writing to Darwin in October, 1862, "My wife went to Cambridge and enjoyed it; I stayed at home! (and enjoyed it), working away at *Welwitschia* every day and almost every night. I entirely agree with you by the way, that after long working at a subject, and after making something of it, one invariably finds that it all seems dull, flat, stale and unprofitable—this feeling, however, you will observe only comes (most mercifully) after you *really* have made out something worth knowing."[4] Hooker's account of *Welwitschia* was eventually published in the *Transactions of the Linnean Society* for 1863 and it was in this paper that the plant was formally named after its Austrian discoverer. The specific epithet *mirabilis* literally translated from Latin appropriately means "wonderful" or "extraordinary."

Botanically what Hooker had managed to establish was the strong similarities of *Welwitschia* to the equally strange genera *Ephedra* and *Gnetum* (see next month's *Bulletin*) as well as all of the basic facts of its structure. Hooker demonstrated that *Welwitschia* was in many ways much less specialized than flowering plants (angiosperms) and he thus placed it in a loose assemblage of more or less unspecialized seed plants called the gymnosperms. Since Hooker's work a great deal more has also been learned, but even after 120 years there is much about *Welwitschia* that botanists still find strange, and even more, particularly about its biology, that we do not understand.

Populations of *Welwitschia* plants are scattered through a restricted zone extending for about 1,200 km (745 miles) down the coast of southwestern Africa from about 10 to 150 km inland (fig. 4). Geographically this area is comparable to the Atacame Desert of Chile and Peru or the Baja Desert of California and Mexico, all three of these great barren areas being on the western edge of a large continental mass with their shores bathed by cold water currents. Throughout most of its geographical range, *Welwitschia* experiences no more than 100 mm of rain per year and sometimes none at all,[6] and this raises the obvious question of how does a structurally unique plant such as this survive in these arid and seemingly inhospitable conditions?

Most plants living in such habitats (collectively termed xerophytes—literally "dry plants") appear to be adapted in some way to the adverse conditions of their environment. Typically they have small leaves in which the reduced surface area minimizes the dangers of overheating and excessive water loss. Other xerophytes shed their leaves in the dry season or store water in fleshy stems (as in cacti) for use during the most arid parts of the year. Other desert plants literally seem to avoid drought, growing rapidly when water is available but surviving as dry fruits or seeds in the soil when conditions become arid again.

Some xerophytes have specialized physiological mechanisms to allow them to carry out photosynthesis (make their own carbohydrates from carbon dioxide and water) in these harsh environments. In most plants the breathing pores in the leaves (stomata) open during the day to permit the entry of carbon dioxide, which supplies their raw source of carbon. In the desert, when the stomata open to let carbon dioxide in, they are

5. Professor H. Humbert (Muséum d'Histoire Naturelle, Paris) with a living *Welwitschia* plant in Angola. Note the contrast between the large leaves of *Welwitschia* and the small leaves and spines of the vegetation in the background. Humbert collected the *Welwitschia* specimens now housed at Field Museum in 1937. B79564

equally efficient at letting precious water out. Some xerophytes cleverly sidestep this difficulty by opening the stomata only at night when temperatures, and therefore the problems of dehydration, are minimized. They have evolved a means of fixing and "storing" the carbon dioxide taken up during the night as a weak acid, making the carbon available again internally during the day for the production of sugars and other carbohydrates, thus saving valuable water.

Welwitschia resolutely provides exceptions to all of these generalizations about xerophytes. It directly confronts its harsh environment by having persistent leaves with a large surface area and it stores very little water in the leaves, stem, or root (figs. 5 and 6). Still worse, it appears to commit physiological suicide by opening its stomata during the day, albeit in the early morning and evening when temperatures are relatively low. Even at these times, however, temperatures may be as high as 30°C (about 86° F) and clearly result in huge losses of water.[6] As one plant physiologist recently put it, "If botanists should construct a plant best adapted to desert environment, they would never come up with a monster like *Welwitschia mirabilis*."[6]

What then are the secrets to *Welwitschia*'s survival success? Its large leaves and inhospitable habitat place it immediately in a double bind. The large leaves need to lose water to prevent overheating (just as sweating is a necessary human response to heat stress) but the plant grows in a desert, where water is an extremely scarce commodity. Part of the answer to this seeming paradox is provided by the remarkable *Welwitschia* leaf: not only does its tough fibrous construction resist incessant sand blasting in the desert winds but it is also highly reflective, working in a way analogous to that of the tinted reflective glass of some modern buildings and reflecting almost half the solar radiation with which it is bombarded.[6] This in itself is a significant improvement over the leaves of many of our common trees, in which only about 25 percent of the radiation is reflected—the remaining 75 percent being absorbed and contributing to the problem of overheating. A second and still more surprising element of the "solution" is that water loss, through evaporation from the leaves, cancels out about an additional 14 percent of the total energy input.[6] This is a common phenomenon among plants that grow in habitats where water is plentiful, but in a desert plant it makes little sense to consistently waste such a valuable resource and raises the obvious question of where does *Welwitschia* get its water?

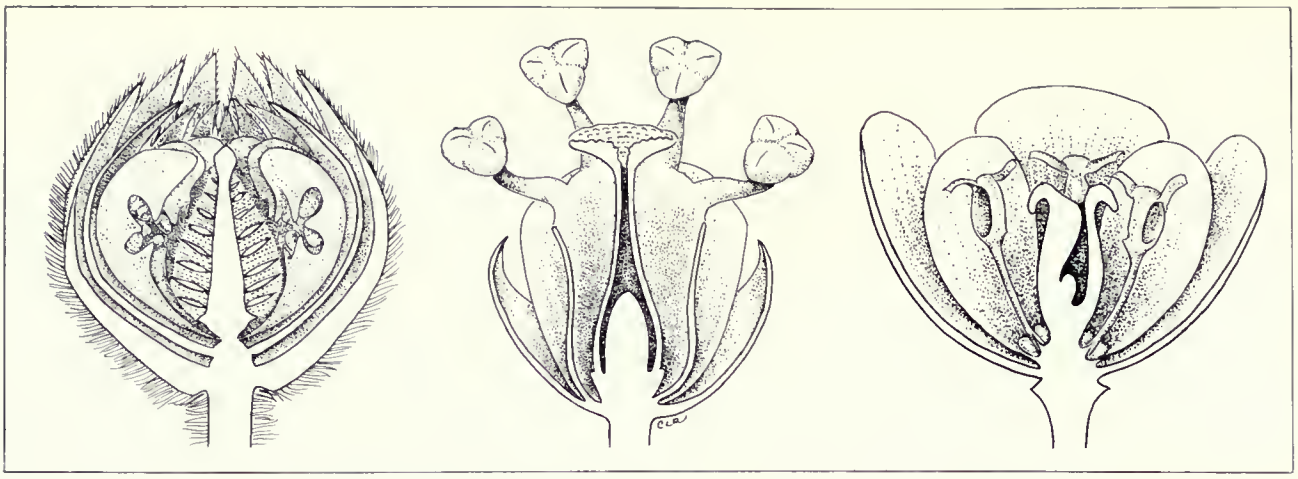
J.D. Hooker himself obliquely addressed this question, implying that plants may have obtained water from the fogs and heavy dews that commonly

occur over much of the *Welwitschia* area. As in the Atacame and Baja deserts this condensation of water vapor sometimes occurs on a massive scale when hot continental air mixes with cool air associated with the cold coastal water currents. Unfortunately the idea that *Welwitschia* plants may use this condensed water raises as many problems as it solves. *Welwitschia* leaves have no obvious structures to absorb such free water. Although it is possible that the breathing pores (stomata) could play some role in absorbing water from the air, there is only a very short period when this might be possible: in the early morning before temperatures rise too high or before the stomata close. Rough calculations show that water absorption by the leaves is unlikely to account for more than about 2 percent of a plant's annual water needs.[6]

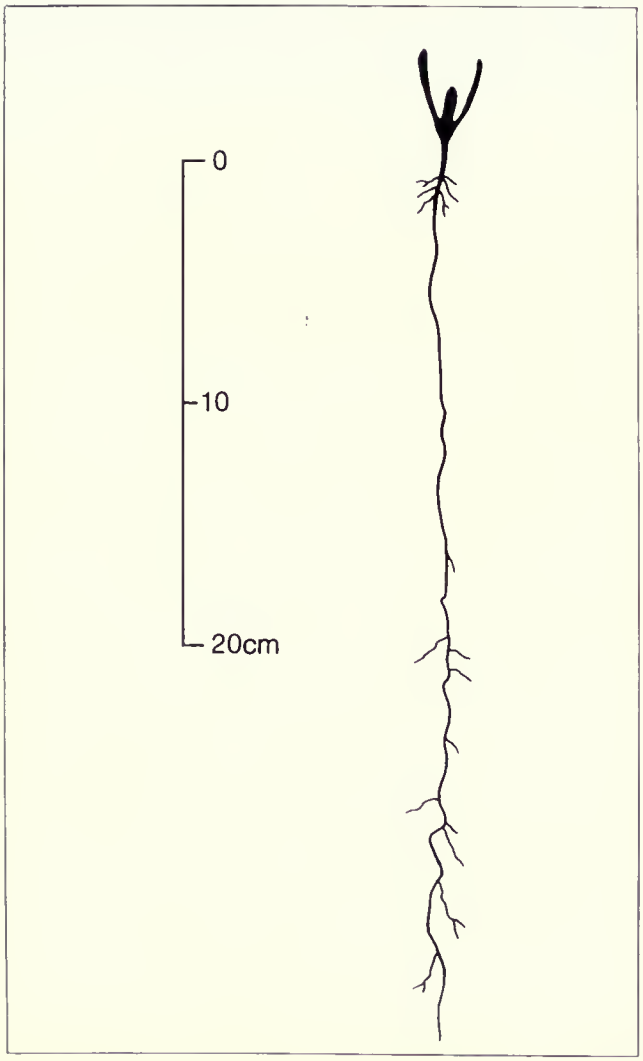
If *Welwitschia* doesn't get its water through the leaves, the only other possibility is that it is somehow obtained by the roots. Even for botanists, roots are one of the most neglected parts of all plants. Usually they are "out of sight and out of mind" and it is difficult to study how they work except in cultivation, where it is almost impossible to duplicate precisely the conditions they encounter in their natural habitat. This is particularly true of *Welwitschia*, and although we know it has a huge taproot resembling a giant woody carrot (figs. 6 and 7), we have no idea how far down or how extensively the much finer roots penetrate. Clearly however, an extensive root system is critical to the survival of the plant. Cultivated *Welwitschia* plants are usually grown in long pipes to accommodate the taproot, and even a 10-week-old seedling of *Welwitschia* only an inch or two high has already developed a main root well over a foot long (fig.9). It seems that this extensive root system, perhaps in conjunction with a highly specialized and efficient system of water-conducting cells which occur in *Welwitschia* and related plants, is the key to survival. The roots of *Welwitschia* apparently provide access to water sources unavailable to other plants and are capable of maintaining the essential water supply to the leaves to compensate for water lost into the air. It is a wasteful system which verges on the ridiculous for a desert plant, but its effectiveness here cannot be disputed. In a recent drought lasting over two years, the timeless *Welwitschia* plants survived while the few plants growing with them died off completely.[6]

7. The massive apex of a *Welwitschia* taproot (approximately 4 feet in diameter) showing the gnarled, tangled mass of roots and the fibrous leaves shredded into numerous strands (compare fig. 6). 360395

6. Model of a young *Welwitschia* plant showing the stout woody tap root and the two leathery leaves that are retained by the plant throughout its entire life (compare fig.7). 81801



8. Sections through the hermaphrodite (bisexual) "flowers" produced by three different groups of plants. Each "flower" shows the seed-producing (female) organs in the center, surrounded both by the pollen-producing organs (male), and structures resembling petals. This arrangement is frequently thought to be linked to the operation of insect pollination systems. *Williamsoniella coronata* (left) (approximately 180 million years before present), is one of the bisexual "flowers" produced by an extinct group of fossil plants known as the Bennettitales. The female organs in this group consist of a central mass of small seeds and scales and the flower may have been pollinated by beetles. *Welwitschia mirabilis* (center) has functionally unisexual "flowers" in which the single central female organ (ovule) never develops into a seed. However, the funnellike apex of the ovule secretes a large nectarlike pollination drop which may be important in attracting insect pollinators. *Berberis vulgaris* (right) has bisexual insect-pollinated flowers typical of living flowering plants (angiosperms). In angiosperm flowers the ovule, or ovules, are contained within a central carpel or ovary. Drawings by Clara Richardson.



A further aspect of the biology of *Welwitschia* almost as intriguing as its physiology concerns its reproduction. One of the facts that Hooker was able to infer even from the limited material available to him was that there were distinct male and female *Welwitschia* plants. This is not a particularly unusual situation in the botanical world, but what he also noted was that male plants also produce a female sex organ (technically an ovule) which seems to be nonfunctional and never develops into a mature seed. Curiously the reproductive parts of a male *Welwitschia* plant resemble a tiny flower with a single ovule (female) surrounded by a fused ring of six structures (male) which produce the pollen (fig. 8). This hermaphrodite (bisexual) flowerlike arrangement is particularly intriguing because the same basic kind of floral organization has also evolved independently in at least two other plant groups: the Bennettitales, which mainly became extinct about 100 million years ago; and the flowering plants, which include most of the plants with which we are familiar today (including all our major crop plants) (fig. 8). In most flowering plants and the Bennettitales both the male and female organs in each flower are functional, but just as with its physiology, *Welwitschia* defies generalizations based on more familiar plants.

What then is the function (if any) of the ovule in the center of the male "flower" if it is unable to develop into a mature seed? Although we still cannot answer

9. Silhouette drawing of a *Welwitschia* seedling showing the extensive root system formed very early in the development of the plant (redrawn from Von Willert[6]).

this question with any certainty, we do have a few scattered observations which hint at a possible solution. First, the apex of the ovule is unusually expanded into a prominent funnel, which secretes a large drop of fluid precisely at the time the pollen is being shed (fig. 8). Second, many male flowers are tightly clustered together in an erect and visually prominent group (fig. 10), and third, the flowers have a yellow-brown color and distinctive odor that is often associated with pollination by flies in living flowering plants.[7] All the signs are that pollination in *Welwitschia* is achieved with the aid of insects, the secretion from the tip of the ovule acting as an attractant encouraging visits by flies and thus promoting the transfer of pollen to female plants. Although the fieldwork necessary to test these ideas has still not been carried out, the possibility of insect pollination seems strong and an almost identical pollination system occurs in one of *Welwitschia*'s closest relatives, the genus *Ephedra* (next month's *Bulletin*).

Darwin once referred to *Welwitschia* as the "platypus" of the plant kingdom.[5] The metaphor was well chosen. Like the platypus, *Welwitschia* is a fortunate and biologically remarkable survivor of an ancient and unusual group of organisms. However, the evolutionary interest in this bizarre plant does not reside solely in its unique and critical position in the plant kingdom; it is also a classic example of the important evolutionary process known as "neoteny" (or more strictly "paedomorphosis"): the expression of juvenile characteristics in the adult as a result of either acceleration of reproductive maturity or truncation of vegetative development. Neoteny has attracted great interest in evolutionary biology because it provides a potential mechanism whereby only a minor developmental modification (relating to the timing of developmental processes) could result in a major effect on the form of the mature organism. This class of phenomena (collectively subsumed under the term heterochrony) is thought to have played an important role in the evolution of numerous organisms ranging from man to flowering plants, but there is no better example of these phenomena in the botanical world than *Welwitschia*.

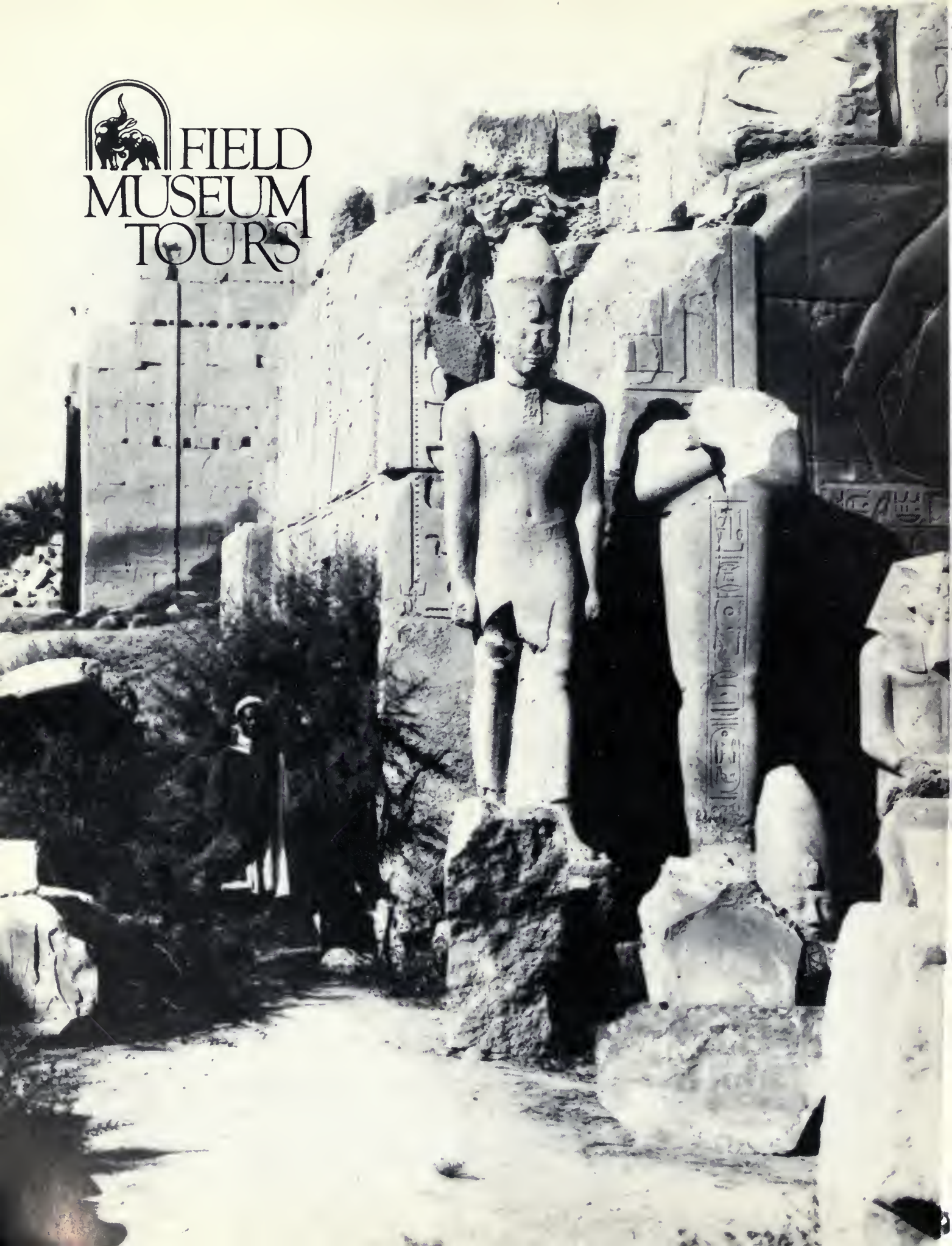
Even in the first technical descriptions Hooker described the plant as "a seedling arrested in development." Hooker was referring mainly to the production of only two leaves throughout the life of the plant, but other features of *Welwitschia* show similar "juvenile" characteristics. It must surely be one of the most bizarre paradoxes of botany that these gnarled, slow-growing, and frequently ancient plants seem in a sense to have discovered the secret of eternal youth. **FM**

10. A model of a *Welwitschia* pollen-producing (male) inflorescence showing numerous small "flowers" borne in conelike structures. The model is currently on display in "Plants of the World" (Hall 29). 81795

References

1. Welwitsch, F. 1861. Extract from a Letter, addressed to Sir William J. Hooker, on the Botany of Benguela, Mossamedes Etc., in Western Africa. *Journal of the Proceedings of the Linnean Society, Botany,* 5:182-187.
2. Bornmann, C. H. 1978. *Welwitschia* Paradox of a Parched Paradise. C. Struik Publishers, Capetown & Johannesburg. 71 pp.
3. Hooker, J. D. 1864. On *Welwitschia,* a new genus of Gnetaceae. *Transactions of the Linnean Society of London,* 24:1-48.
4. Huxley, L. 1918. Life and Letters of Sir J. D. Hooker. vols. 1 & 2. John Murray, London. 546 pp. & 569 pp.
5. Darwin, F. 1903. More letters of Charles Darwin. John Murray, London. 508 pp.
6. Von Willert, D. J. 1985. *Welwitschia mirabilis*—new aspects in the biology of an old plant. *Advances in Botanical Research,* 1985:157-191.
7. P. K. Endress, personal communication.
8. Hiern, W. P. 1896. Catalogue of the African plants collected by Dr. Friedrich Welwitsch in 1853-61: Dicotyledons Part 1. British Museum (Natural History). 336 pp.
9. Kers, L. E. 1967. The distribution of *Welwitschia mirabilis* Hook. f. *Svensk Bot. Tidskrift,* 61:97-125.

FIELD MUSEUM TOURS



FIELD MUSEUM TOURS

Dear Field Museum Member,

We are working toward organizing domestic Field Tours next year and would like to share with you some of the destinations being considered.

Crow Canyon Archaeological Center in Denver, offers an oppotunity for a hands-on introduction to the actual business of *being* an archaeologist with digging and lab work at the side of the archaeologists themselves.

We are excited about exploring the Southwest, especially **Anasazi sites.** Other plans are to visit Museums featuring a special exhibit and organizing a program to enjoy the points of interest in the area.

In 1988 we will repeat our **China Tour,** with Katharine Lee as leader, and the **Kenya/Tanzania Safari** (early 1989) led by Audrey Faden.

If any of these destinations particularly appeals to you, just send an advance deposit of $50 per person to Field Museum's Tours office, to ensure your place. You will be notified about all upcoming activities related to the tour, and the deposit is completely refundable should you change your mind prior to the first installment payment.

When you travel with Field Museum you travel with a purpose. Your Tour Leader is a constant source of information about the flora, fauna, and cultural heritage. Please watch for future announcements. We hope to hear from you.

Sincerely,

Dorothy S. Roder

Dorothy S. Roder

For reservations, call or write Dorothy Roder (322-8862), Tours Manager, Field Museum, Roosevelt Rd. at Lake Shore Dr., Chicago, Il 60605

Field Museum of Natural History
Membership Department
Roosevelt Road at Lake Shore Drive
Chicago, IL 60605-2499

FIELD MUSEUM OF NATURAL HISTORY BULLETIN

March 1988

Birds in Art

Opens Saturday, March 26

Field Museum of Natural History Bulletin

Published since 1930 by
Field Museum of Natural History
Founded 1893

Editor/Designer: David M. Walsten
Production Liaison: Pamela Stearns
Staff Photographer: Ron Testa

BOARD OF TRUSTEES

Robert A. Pritzker
Chairman
Mrs. T. Stanton Armour
George R. Baker
Robert O. Bass
Gordon Bent
Mrs. Philip D. Block III
Willard L. Boyd,
President
Robert D. Cadieux
Worley H. Clark
James W. Compton
Frank W. Considine
William R. Dickinson, Jr.
Thomas E. Donnelley II
Thomas J. Eyerman
Marshall Field
Ronald J. Gidwitz
Clarence E. Johnson
Richard M. Jones
John James Kinsella
Robert D. Kolar
Hugo J. Melvoin
Leo F. Mullin
James J. O'Connor
James H. Ransom
John S. Runnells
Patrick G. Ryan
William L. Searle
Mrs. Malcolm N. Smith
Robert H. Strotz
Mrs. Theodore D. Tieken
E. Leland Webber
Blaine J. Yarrington

LIFE TRUSTEES

Harry O. Bercher
Bowen Blair
Stanton R. Cook
Mrs. Edwin J. DeCosta
Mrs. David W. Grainger
Clifford C. Gregg
Mrs. Robert S. Hartman
Edward Byron Smith
John W. Sullivan
J. Howard Wood

CONTENTS

March 1988
Volume 59, Number 3

MARCH EVENTS AT FIELD MUSEUM 3

BIRDS IN ART AT FIELD MUSEUM
by John W. Fitzpatrick, Chairman, Department of Zoology . . 7

CHINESE PEWTER TEAPOTS AND TEA WARES
by Ho Chuimei, Research Associate in Anthropology, and Bennet Bronson, Associate Curator of Asian Archaeology and Ethnology 9

THE GNETALES
Botanical Remnants from the Age of Dinosaurs.
by Catherine D. Hult, Laboratory Assistant, Geology and Peter R. Crane, Associate Curator of Paleobotany 21

FIELD MUSEUM TOURS
Featuring July Voyage to the Gulf of St. Lawrence and Canada's Maritime Provinces 30

COVER
Teapot in bucket shape. Pewter with applied brass and bronze. The depressed panels bear various auspicious motifs in appliqué. Wooden buckets of this form are still used in China for cooked rice, bean curd, and similar foodstuffs. Although real buckets have removable tops, this one is integral with the body; a small sliding lid allows the pot to be filled and gives access to a removable tea basket. Overall height 21 cm. Chinese, 19th century. Gift of E. E. Ayer, 1927. FM 110477. For more on Chinese pewter teapots and tea wares, see pages 9-19. Photo by Ron Testa. A-110596

"Mothers and Daughters"

Unprecedented exhibition of 128 photos of American mothers and daughters remains on view through March 13

Volunteer Opportunities

Share your interest in American Indian cultures with school groups and the general public: volunteer training for American Indian hall progams will begin Saturday, March 26. Challenging and rewarding opportunities are available for weekday and weekend volunteers. For more information, please contact the Volunteer Coordinator at (312) 922-9410, ext. 360.

Field Museum of Natural History Bulletin (USPS 898-940) is published monthly, except combined July/August issue, by Field Museum of Natural History, Roosevelt Road at Lake Shore Drive, Chicago, IL 60605-2496.

Copyright ©1988 Field Museum of Natural History.

Subscriptions: $6.00 annually. $3.00 for schools. Museum membership includes *Bulletin* subscription. Opinions expressed by authors are their own and do not necessarily reflect the policy of Field Museum. Unsolicited manuscripts are welcome. Museum phone: (312) 922-9410. Notification of address change should include address label and be sent to Membership Department. Postmaster: Please send form 3579 to Field Museum of Natural History, Roosevelt Road at Lake Shore Drive, Chicago, IL 60605-2496. ISSN: 0015-0703. Second class postage paid at Chicago, Illinois and additional mailing office.

EVENTS

Field Museum's Tropical Connection

Many of Field Museum's biological research programs are focused on the tropics. The richness of species and complexity of biological interactions in the tropics are the primary reasons for this research emphasis. Four of the Museum's outstanding scientists discuss their tropical research efforts and Field Museum's critical link in the study of the quickly vanishing New World tropics.

March 2
"Birds of Tropical South America"
John Fitzpatrick, Chairman, Department of Zoology, Field Museum

THE BIRDS OF THE AMAZON BASIN are heavily impacted by the rapid destruction of the tropical rain forests. Focusing on the mountains that form the west edge of the Amazon basin, Dr. Fitzpatrick has identified ecological "island" refuges. Here, the birds are able to breed, diverge, create new species, and reestablish outside the "island" refuges.

March 9
"Fishes of the Orinoco"
Barry Chernoff, Associate Curator and Head, Division of Fishes, Field Museum

THE ORINOCO RIVER BASIN is the second largest in South America, draining almost all of Venezuela and much of Colombia, east of the Andes. The fishes of the Orinoco—more than 600 identified species—live in a variety of habitats. Dr. Chernoff's research includes the piranha, electric fishes, head standers, hatchet fishes, and others.

March 16
"The International Link"
Bruce Patterson, Associate Curator and Head, Division of Mammals, Field Museum

FIELDWORK IN THE TROPICS can require great expense and tremendous logistical coordination. On location, the resources from developed nations are blended with local expertise, producing mutually beneficial results. Learn how Field Museum scientists work closely with researchers from Latin America on such projects as compiling a biological inventory at a future dam site, studying geographic variation in Andean bats, and other scientific research programs.

March 23
"Flora of Peru—A New Tropical Treasure Trove"
Michael Dillon, Associate Curator, Department of Botany, Field Museum

MORE THAN 65 YEARS AGO, Field Museum scientists began collecting and studying the flora of Peru. Dr. Michael Dillon continues this research commitment to the rich and exciting Peruvian landscape. From relict forests to desert coastline, the magnificence of Peruvian plant life and the Museum's active programs of plant exploration and research in Peru are discussed.

AC88101 Wednesdays, 7:00-9:00pm
March 2-23
(4 sessions)
$50 ($40 members)

Continued ▷

EVENTS

Wildlife Images in Art

Saturday, March 26, 2:00pm
Kent Ullberg, Master Wildlife Artist
Padre Island, Texas

THE 1987 MASTER WILDLIFE ARTIST is Swedish-born sculptor Kent Ullberg. His "Whooping Cranes" is included in Field Museum's exhibit, "Birds in Art," opening March 26. Ullberg's highly realistic animal imagery, his commitment to nature, and his involvement with conservation have made him one of the best loved contemporary wildlife artists. His work has been shown worldwide, including exhibits in the United States, China, Great Britain, France, and Botswana.

From his studio on Padre Island, off the coast of Corpus Christi, Texas, Ullberg creates the forms that serve both art and natural science. "I feel an enormous hunger for knowledge about my subject matter," he says. "To feel it, feel the firmness of the flesh, those muscles, the beautiful forms. I sketch them. I take measurements, everything to drain as much knowledge as possible, and only then do I feel I have the background and the freedom to create the shapes I need, that I want."

Growing up in a coastal Swedish town of artist parents, Ullberg's interest in art and natural science began early. He studied art in Stockholm and at museums in Germany, the Netherlands, and France. He lived for seven years in Botswana, Africa, studying its wildlife and people.

Ullberg believes his wildlife sculpture is very much a contemporary expression and art form. As art often reflects cultural and political concern of the time, Ullberg's work reflects his deep concern with the state of the global environment. It is, he says, "a logical form of a personal expression."

Join Kent Ullberg as he discusses wildlife as an inspiration for artists. He looks at how the wilderness has specifically influenced his work and how his art, in turn, is a part of contemporary aesthetics and a socio-political statement.

LL88101 Wildlife Images in Art
Tickets: $6.00 ($4.00 members)

Kent Ullberg

Registration

Be sure to complete all requested information on this ticket application. If your request is received less than one week before the program, tickets will be held in your name at the West Entrance box office. Please make checks payable to Field Museum. Tickets will be mailed upon receipt of check. Refunds will be made only if the program is sold out.

Return complete ticket application with a self-addressed stamped envelope to:

Field Museum of Natural History
Public Programs: Department of Education
Roosevelt Road at Lake Shore Drive
Chicago, IL 60605-2497

Name _____

Address _____

City _____ State _____ Zip _____

Telephone: Daytime _____ Evening _____

☐ Member ☐ Nonmember

American Express/Visa/MasterCard

Card Number _____

Signature _____ Expiration Date _____

Program	#Member Tickets	#Nonmember Tickets	Total Tickets	Amount Enclosed
"Wildlife Images in Art," LL88101				
"Field Museum's Tropical Connection," AC88101				
			Total	

☐ Scholarship requested

EVENTS

Edward E. Ayer
Lecture Series

Thursdays in March and April
(no lecture March 31)
1:30pm, James Simpson Theater.
Lectures are free and refreshments are served.

March 3
"Madagascar: The Forgotten Island"
John Fitzpatrick, Chairman,
Department of Zoology, Field Museum

HOME TO SOME of the world's most unusual species of plant and animal life, Madagascar is rapidly becoming a biological wasteland due to deforestation.

March 10
"Machu Picchu and the Inca Empire"
Charles Stanish, Assistant Curator,
Department of Anthropology, Field Museum

LEARN HOW THIS ANCIENT CITY was located by archaeologists in 1911, and how it has affected our understanding of the Inca Empire.

March 17
"Images of the Buddha"
Charles Hallisey, Instructor,
Department of Theology, Loyola University

THIS LECTURE FOCUSES on many different representations of the Buddha found in the art of various cultures. Learn to read this sacred art for its symbolism and teaching.

March 24
"Searching for the Earliest Life"
Matthew Nitecki, Curator,
Department of Geology, Field Museum

LEARN HOW PALEONTOLOGISTS are examining the fossil record to understand the evolutionary history of life on Earth.

Family Activities

Black Traditions Theatre

Young people take African folktales and blend them with contemporary urban experiences.

"Tandika Tales"
Chocolate Chips Children's Theatre
Saturday and Sunday, March 5 and 6, 2:00pm

Based on stories written by children, these myths and scary stories about thunder, lightning, and stars are blended with dance, humorous "commercials," and toe-tapping tunes.

"Kids From Cabrini"
Free Street Theatre
Saturday and Sunday, March 19 and 20, 2:00pm

"Kids From Cabrini," a theatre workshop for children 7 to 14 years old, presents African folktales linking their African heritage with their everyday life in the city. The group developed from a Free Street Theatre program involving children from Cabrini-Green.

World Music Program

Weekends in March
1:00pm and 3:00pm

MUSIC COMMUNICATES IN MANY WAYS. It is something that can be shared by all of us, whether or not we have common lifestyles, beliefs, or even languages. From the gentle harp of Light Henry Huff and the lively and spirited stories and songs of Shanta, March is a musical celebration at the Field Museum. The World Music Program is supported by the Kenneth and Harle Montgomery Fund and a City Arts IV grant from the Chicago Office of Fine Arts, Department of Cultural Affairs.

March Weekend Programs

EACH SATURDAY AND SUNDAY you are invited to explore the world of natural history at Field Museum. Free tours, demonstrations, and films related to ongoing exhibits at the Museum are designed for families and adults. Listed below are only a few of the numerous activities each weekend. Check the activity listing upon arrival for the complete schedule and program locations. The programs are partially supported by a grant from the Illinois Arts Council.

March

5 2:00pm *Traditional China* (tour). Delight in the timeless imagery and superb craftsmanship of Chinese masterworks in our collection.

6 2:00pm *A Walk with China's Animals* (tour). Meet some of China's real and imaginary beasts through Field Museum's exhibits.

12 1:30pm *Tibet Today and Tour of Tibet* (slide lecture). Tour through the Tibet exhibit after looking at Lhasa and other towns now open to the public.

13 2:00pm *Malvina Hoffman: Portraits in Bronze* (slide lecture). A look at the life and works of Malvina Hoffman, concentrates on the Portraits of Mankind collection.

26 1:30pm *Tibet Today and A Faith in Exile* (slide lecture). Investigate Lhasa and refugees in Dharmsala (home of the Dalai Lama), Darjeeling, and Sikkim.

These programs are free with museum admission and tickets are not required.

BIRDS IN ART AT THE FIELD MUSEUM

The Union of Art and Science

by John W. Fitzpatrick
Chairman, Department of Zoology
and Curator of Birds

The Field Museum is privileged to host for the first time a traveling exhibit of immense popular appeal and growing international importance. The Twelfth Annual "Birds in Art" exhibition makes its final stop here, from March 26 through May 22. The collection of 50 original paintings and 10 sculptures was organized by the Leigh Yawkey Woodson Art Museum in Wausau, Wisconsin, and has become widely recognized as the best annual show of bird art in the western world. Artists from all over the United States and numerous foreign countries compete each year to have their work included in this prestigious exhibit. Original submissions for this year's exhibit numbered over 750. A panel of judges selected 126 pieces for the original opening at Wausau, which showed during September and October of last year. Sixty of these were selected to comprise the touring exhibit that will hang at the Rochester Museum and Science Center and the Natural History Museum of Los Angeles County before coming to the Field Museum of Natural History.

"Birds in Art" is a unique assemblage indeed, featuring works by some of the finest wildlife artists in America and abroad. Because so many fine artists are represented together, sharing birds as their common element, the show becomes a very personal one to the viewer. It offers us a rare chance to compare first hand the artistic effects of style and medium, as well as to enjoy the birds and the individual captured moments in their own right. Included are oils, watercolors, gouaches, acrylics, and printed graphics as well as sculptures in wood, stone, brass, and steel. Some pieces are large, some are small. Represented in this year's show are everyday songbirds such as cardinals and chickadees, as well as dramatic depictions of eagles, hawks, and owls. A huge and breathtaking canvas entitled *The End* depicts a stately male California condor, the most critically endangered bird species in the world. The show is a potpourri of natural and beautiful moments.

Why is an art show such as this exhibited in a great natural history museum? Ours is a temple of science, after all, and many visitors imagine a "great divide" that separates science from art. I, for one, imagine no such divide, and "Birds in Art" presents a wonderful example of the union between these two great features of the human endeavor. As pointed out by the noted philosopher of science, the late Jacob Bronowski in *The Ascent of Man,* art and science share at their deepest level an inspirational genius that is the same, and uniquely human. Both are creative manifestations of the mind. In their great moments, science and art bring together the observations, personal histories, and skills of the creator into an expression never before achieved, providing new meaning to past experiences. Inspiration in its truest sense, scientific or artistic, is neither wholly rational nor irrational. Neither do these endeavors have meaning in a vacuum. Art without viewers is selfish indulgence, science without readers is self-education. These observations emphasize the social nature of both endeavors, even as we recognize that the inspirations themselves are among the most intensely personal of human experiences. Science and art *belong* together, as the two great pillars of human accomplishment.

Field Museum of Natural History is among the foremost institutions in the world for the scientific study of birds, their origins, evolution, ecology, and behavior. Leigh Yawkey Woodson Art Museum has emerged among the foremost institutions where the artistic study of birds is emphasized. By bringing together these two institutions, "Birds in Art" allows us to glimpse the scientist in each artist, and to ponder the artist within each of us scientists. It is a natural union.

"Whooping Cranes," polished stainless steel sculpture by Kent Ullberg; 69 × 53 × 46 cm. One of ten sculptures to be seen in the exhibit "Birds in Art," opening March 26. Mr. Ullberg was chosen as the Leigh Yawkey Woodson Art Museum Master Wildlife Artist for 1987, only the second sculptor to be selected during the twelve-year history of the prestigious award.

"Morning—Oatka Creek," welded corten steel sculpture of green-backed heron by Craig Wilson. On view in "Birds in Art" exhibit opening March 26.

Chinese Pewter Teapots and Tea Wares

by Ho Chuimei and Bennet Bronson

Photos by Ron Testa

1. Tea caddy with octagonal body and single-walled lid. Pewter; applied brass. The large size and elaborate decoration are unusual. The characters on the neck form a proverb: "The family that accumulates virtue will have ample fortune." The panels on the upper body depict amusements of the literati. Those near the base depict foreigners—Central Asians, one probable European—in comic poses. Two incised characters on the bottom read "Liang Ji," probably the name of a shop. Overall height 45 cm. Chinese, perhaps 17th-18th century. Gift of E.E. Ayer, 1924. FM 110008 A-110595

Introduction

Nowadays, Serious Chinese Tea Drinkers are unanimous in thinking that the best possible material for teapots and many of the other containers used in making tea is the red or brown earthenware of Yixing in eastern China. But this was not always so. Tea lovers of earlier periods often preferred porcelain, precious metals, or even pewter.

The idea that pewter could be used in this way may come as a surprise. After all, it is an alloy of tin and lead, and thus is poisonous. Yet it was extensively employed in China for many centuries not only for tea storage containers—a role in which its toxic qualities might be less important—but also for teapots, kettles, and cups, where heat and tannic acid would be bound to extract a certain amount of lead into the prepared tea. We will not discuss the issue of lead toxicity further here except to say that Chinese tea experts of the past never discussed it either. Few of them seem to have

Ho Chuimei is a Research Associate in Anthropology; Bennet Bronson is Associate Curator of Asian Archaeology and Ethnology.

been aware that the lead in pewter might pose health problems. Lest we conclude that those experts were strangely ignorant, we should recall that wine fanciers in the United States still often prefer "crystal" glasses and — worse — decanters, apparently unaware that these contain as much lead as any pewter. Connoisseurship and technical sophistication do not go hand-in-hand, either in China or the West.

2. **Earthenware teapot.** Pumpkin-shaped body and lion as lid finial. The bottom bears an impressed seal, "Yixing purple sand (ware)." Body diameter 12 cm. Made at Yixing, early 20th century. Purchased by B. Laufer in Shanghai, 1921. FM 264842 A-110589

The objects described here all come from the collection of Field Museum, which probably has more Chinese pewter (about 200 pieces) than any other museum in the country. The bulk of the collection was donated by E. E. Ayer, one of the founders of the Museum and the first chairman of its Board of Trustees. Ayer acquired his pewter in the 1920s from Yamanaka, a well-known art dealer, with the advice of the then-curator of Asian Anthropology, Berthold Laufer. Laufer himself purchased about 70 pieces while in China (in Xian, Chengdu, and Shanghai) in 1908-10 and 1922. The remaining pieces were given by other individuals, among them the late Commander and Mrs. G. H. Boone.

Pewter and the History of Tea

Pewter first appears in connection with tea in about A.D. 1240—during the late Song period—when Zhao Xigu, a member of the imperial family and noted antique collector, comments: "The nature of tea leaves is not in harmony with that of ceramic or bronze jars. They only go well with pewter. But be careful not to use jars with holes that can leak air. The containers should be repeatedly tested before use." All of Zhao's contemporaries might not have agreed. But it is clear that pewter containers were already widely used for storing dry tea leaves.

By the middle Ming period (the 16th century), pewter was also used for teapots. Experts such as Qian Chunnian (1540s) and Xu Ciyu (1597) preferred it in that role to porcelain. Other experts disagreed, however. Tu Long (also 1590s), for instance, claimed that teapots made of any metal—including pewter, as well as bronze, iron, and tin—imparted a bitter, fishy smell to the brewed tea. It is interesting to note that Xu Ciyu preferred pewter teapots precisely because, unlike

those of earthenware, they did *not* add an objectionable smell.

In the late 16th and early 17th centuries pewter became quite popular as a material for tea wares. If used together, the kinds of pewter utensils recommended by various contemporary experts would make up a comprehensive set: large storage caddies, dippers for drawing water from jars, kettles for boiling water, small serving or presentation caddies, and water pots for holding boiling water, as well as the pots in which the tea was actually brewed.

We do not know what any of these looked like. Western museums contain very few pewter objects of any kind that can be firmly dated to the Ming period (1368-1644). Several caddies in Field Museum were attributed by Laufer to the 17th century on the basis of style (fig. 1). While this date seems plausible, solid proof will have to wait until the contents of the many recent excavations of Ming tombs become available for study.

3. **Teapot with side handle.** Pewter exterior, earthenware lining, and jade fittings. Engraved with plum blossom motifs on one side and an inscription about tea on the other, with the signature of Shimei. A clay seal on the lining reads "Made by Yang Pengnian." The fact that both the calligrapher and the potter are well known figures in the history of Yixing ware makes this an important piece. Body height 6 cm. Made at Yixing, *ca.* 1820-30. Gift of E. E. Ayer, 1927. FM 125834 A-110583

Yixing and Pewter Wares

The red earthenware vessels of Yixing in Jiangsu Province, not far from the city of Suzhou, first began to be noticed by tea fanciers in about A.D. 1250. By about 1500, the Yixing potters had developed types of teapots that came to be widely admired for artistry as well as their almost unique suitability for brewing tea (fig. 2). And yet pewter became a serious competitor later in the same century. Xu Ciyu, writing in 1597, definitely preferred pewter to Yixing earthenware. He complained that good Yixing pots were expensive, hard to get and easily broken, while inferior Yixing pots had an undesirable clayey smell that made them useless for brewing or serving tea. Pewter, Xu felt, has none of these disagreeable traits.

The debate over the relative merits of pewter and Yixing tea wares continued for the next hundred years. As far as brewing tea went, the issue was eventually settled in favor of the latter. A glance through the contents of a modern tea shop will show that, while connoisseurs still often prefer pewter containers as tea caddies, they acknowledge Yixing ware as the queen of teapots.

At one point, however, a compromise was attempted. In the early 19th century, teapots began to be made with pewter exteriors and linings of Yixing

4. **Teapot with overhead handle.** Pewter exterior, earthenware lining, and jade fittings. Engraved with orchid leaves on one side and on the other a poem in praise of tea signed by the calligrapher, Boya[ju]. The lining bears the seal of Shimei. Body diameter 11.5 cm. Made at Yixing, *ca.* 1820-30. Gift of E. E. Ayer, 1926. FM 110764 A-110587

earthenware. Field Museum has 36 hybrid pots of this kind, two bearing reign marks of the Daoguang Emperor (1821-50) and several others with cyclical dates of the same period (fig. 3). The majority have knobs, side handles, and spouts made of jade. Although teapots made entirely of Yixing ware often have overhead handles, these seem to be rare among hybrid examples; Field Museum has only one (fig. 4).

Many clay-lined pewter teapots were actually made at Yixing. Their shapes are close to those of all-earthenware Yixing types, especially those assigned by Terese Tse Bartholomew, a leading modern authority, to the third (19th century) phase of Yixing teapot development. Moreover, the hybrid pots usually bear seals of known Yixing potters — like Yang Pengnian, Huchi, and Shimei—in their interiors. Yang Pengnian was among the most celebrated of all Yixing craftsmen, having been involved with important reforms in the style and decoration of all-earthenware teapots. His hybrid teapots are sealed with his full name, "Yang Pengnian." The custom of adding one's name to one's work, incidentally, was unusual among Chinese craftsmen of the period. Whereas Japanese craftsman had long been accustomed to personalizing their products, in China the potters of Yixing were almost alone in doing so. Calligraphers and painters signed their names proudly; artists in virtually all other media worked in anonymity.

The potter Shimei, also known as Zhu Jian, is said to have invented the hybrid teapot in about 1810. One example in Field Museum is signed by him and two others bear his seal (fig. 4). It is not certain, however, that Shimei himself actually did the pewter work as well as the potting—after all, shaping the two materials

would require very different skills. His motives for encasing an earthenware pot in pewter are also uncertain. The charm of pewter was evidently still appreciated, but it is possible that tea drinkers of the period either were worried about the poisonous effect of lead or were not entirely convinced that the special pewter smell actually enhanced the fragrance of tea.

The outer surfaces of hybrid pewter teapots, like those of many all-earthenware teapots from Yixing, always carry engraved pictures and inscriptions in Chinese characters. While the potters who made the clay linings put their seals inside, the engraver/calligraphers usually added their signatures to the inscriptions. These calligraphers were often artists of the first rank. Some signatures are those of talented amateurs: scholars or officials who were skilled with the brush and graving tool, and presumably fanciers of tea. Occasionally the signatures are those of potters. One of the pieces in Field Museum's collection has an inscription signed by Shimei himself, who was known for his fine calligraphy as well his potting ability (fig. 3).

Readers familiar with conventional Yixing teapots may be interested to know that the hybrid teapots do not conform to the widely accepted rule that all Yixing pots made before the late 19th century have spouts connected to the body by single holes. None of the hybrid examples in Field Museum's collection is later than about 1850. Yet all except two have "late" strainer-like spout connections with multiple holes.

5. Teapot with fitted detachable heater. Pewter with bronze handles. The heater forms the lower part of the vessel, with coin-shaped openings at the sides and a removable container for the fuel and wick. A slanting internal chimney allows smoke and heat to escape from a hole in the top. An impressed seal on the bottom reads "Heng Tai Pewter Shop, guaranteed." Overall height 25.5 cm. Made in Chengdu, Sichuan province, late 19th century. Purchased by B. Laufer in Chengdu, 1910. FM 117754 A-110578

Other Pewter Teapots

A number of kinds of pewter teapots exist that do not have earthenware linings. These are usually larger in capacity than the hybrid pewter-earthenware type and rarely have parts made of jade. The examples in the Museum's collection come from Hunan, Guangdong, and Shanghai. One large type (shown on front cover) is bucket-shaped with a small spout and lid, plus a removable pewter tea basket inside the mouth to simplify the removal of used tea leaves. Ceramic teapots of similar form are still used in China, in restaurants and in the homes and offices of people who often have many guests. Such people are not likely to be connoisseurs of tea. Those serious about the brew almost always insist on teapots of a size that can be emptied in a single round.

Other teapots combine pewter with materials like basketry, coconut shell, and porcelain. Many such pots were made during the late 19th and early 20th centuries. Still other teapots have bodies of red or black clay that is partly covered with pewter cut into openwork designs. The bodies of the red variety seem to be actual Yixing work, decorated by pewterers in Shanghai and Shandong. In design and workmanship these tend to be inferior to the clay-lined pewter pieces made at Yixing.

An interesting group of pewter teapots have heaters built into the base; the idea is like that of an electric kettle except that here the same device is used for warming the water and brewing the tea. Field Museum possesses several examples. All were heated with kerosene, alcohol, or vegetable oil and have concealed chimneys as well as openings for draught (fig. 5). The fact that two of these have fitted tea baskets show that

they are indeed teapots rather than kettles or wine warmers. They would have to be watched carefully; otherwise the tea might boil and thus be ruined. But they were undoubtedly convenient for country outings of the sort that are so often depicted in Chinese paintings and described in literature.

Tea Caddies and Storage Jars

Pewter tea caddies—covered jars for storing tea leaves—go back to at least the 13th century in China. As Feng Kebin noted in 1642, they were as odor-free as caddies made of porcelain and were much more airtight if fitted with double-walled lids. In 1842 an amateur scientist named Zheng Fuguang published a description and drawings of pewter caddy manufacture. To make sure that caddies are air- and waterproof, he suggests that their lids be double-walled, that soldered joints be meticulously tested, and that the interior be lined with paper. Zheng also describes a "base tray" filled with incense ash and paper onto which an inverted caddy can be placed to ensure that the interior stays completely dry. Other writers say that a caddy filled with tea should have layers of ash or lime on the bottom and of dry straw on top. This constant emphasis on the dangers posed by moisture and thus by mold—understandable enough in view of the very high prices paid for the finest teas—suggests another reason why pewter caddies worked especially well. They were not only moisture proof but, through the antibiotic properties of lead, would have discouraged the growth of microorganisms.

6. Japanese tea caddy. Pewter with raised red and gold lacquer. The decoration of the lid and shoulder imitates a wrapping of gold brocade tied with a red cord. The body bears the two imperial crests: the sixteen-petaled chrysanthemum and the kiri, or paulownia flower. An impressed seal on the bottom reads "Imperial Pewter House, first quality, made by Izumō." Overall height 26.5 cm. 19th century. Gift of E. E. Ayer, 1925. FM 110088. A-110576

Large pewter containers were also used for storing tea in bulk. Shen Changqing recommended in 1632 that new tea should be kept in jars made from fine virgin pewter, large enough to hold about thirteen pounds. The mouths of these jars should be filled with a layer of dry grass and several layers of paper before the pewter lid is pressed on. A hundred and fifty years later, however, the poet and artist Wu Qian (1787) expresses a clear preference for porcelain tea storage jars. He states that pewter jars should not be used to hold more than a few days' supply. Whether this opinion was generally shared among serious tea fanciers is uncertain, but large caddy-like storage jars made of pewter certainly continued to be used down through the 20th century. In 1833, Sun Tongyuan had a distressing encounter with such jars while traveling in Sichuan:

"The people at Yongjia prefer year-old tea, thinking that new tea has too much 'fire.' They re-roast the newly bought tea and then store it in pewter jars, tightly sealed but without adding lime cubes (as a desiccant) at the bottom. Thus the tea readily becomes damp and when brewed has a burned smell that irritates the nose. The color is almost red and it has no taste. To force myself to pretend to appreciate it was really as difficult as taking medicine."

Several of Field Museum's pewter tea jars seem too large for use during the actual making and serving of tea (fig. 1). They may have served as bulk storage containers, perhaps for the shelves of tea shops. Most have lids with double walls of the kind that Feng Kebin and Zheng Fuguang recommended.

The Museum has a number of Japanese pewter

7. **Kettle in pumpkin shape.** Age-darkened pewter. The overhead handle has tiger-like animals in relief and dragon's heads at either end. Two other pairs of dragons, also in relief, have been applied to the upper body. The twelve segments of the lower body bear shou ("long life") characters. The impressed seal on the bottom is now illegible. Body diameter 24 cm. Chinese, 18th-19th century. Gift of E. E. Ayer, 1924. FM 110007 A-110581

caddies in its collection. These differ from Chinese caddies in having two separate lids: an inner one that fits tightly inside the mouth and an outer one that covers the top and sides of the neck. Some are handsomely decorated with red and gold lacquer, which forms an effective contrast with the grayish color of the unlacquered areas (fig. 6). They also differ from Chinese caddies in the way they were made. Whereas Chinese pewterers preferred to form caddies by shaping and soldering sheet metal, their Japanese counterparts either made an initial casting which was then finished on a lathe or formed their caddies by "metal-spinning" —forcing a pewter plate against a form while turning both at high speeds on a lathe-like apparatus. The interiors of Japanese caddies show many concentric ridges and grooves; the interiors of Chinese caddies tend to be quite smooth.

Kettles and Water Pots

The Chinese also once used pewter tea kettles. In 1597, Xu Ciyu states that pewter is best for making kettles because water boiled in it does not become salty or bitter. In 1632, Shen Changqing grants that silver is at least as good for kettles but recommends pewter for use by tea lovers of modest means. He says that ceramic

8. **Teapot with gate-shaped handle.** Pewter; applied bronze and brass; partial cane wrapping on handle. Each facet of the body is decorated with a different Taoist folk deity. Indentations in the deities' costumes show they were once inset with glass or stone. Body diameter 11 cm. Chinese, 19th century. Gift of E. E. Ayer, 1925. FM 110055 A-110584

9. Tray, perhaps for tea utensils. Pewter with brass inlay depicting plum blossoms and bamboo. True inlay, with designs in a contrasting material set into the surface, is rare on Chinese pewterwork. An impressed seal on the base reads "Made by Liu Hongda." Length 34 cm. Chinese, 19th century. Gift of E. E. Ayer, 1926. FM 110100 A-110575

kettles are too easily broken. He also is emphatically opposed to bronze and — interestingly — iron, which Japanese tea lovers have long regarded as an ideal kettle material. Shen's opposition to iron kettles was shared by many other early Chinese authorities, who often commented on the bad taste that iron imparts to water.

Quite apart from their potential toxicity, pewter kettles would seem to have another grave disadvantage. Pewter melts at a temperature of only several hundred degrees centigrade. This means that a kettle made out of pewter would probably be ruined if allowed to boil dry over a moderately hot stove. Yet pewter teapots did exist and were indeed used. Field Museum possesses several examples. One of these has an internal chimney and a miniature firebox in which charcoal was burned. Another, an exceptionally handsome piece, would have been heated conventionally on top of a separate stove. That this is indeed a kettle is virtually proved by its shape and size (fig. 7); one finds it hard to imagine any other function. How old it is and where it was made is currently unclear. Its pumpkin-shaped body suggests a connection with the Yixing tradition of tea ware design, and its dark, eroded surface suggests considerable age. However, that is as far as we dare to go for now. Neither we nor anyone else we have shown it to have seen another kettle like it.

The Museum possesses a number of tall, long-spouted ewers that resemble surviving illustrations of the water pots that were used in the Tang through early Ming periods (*ca.* 700-1500) as an intermediate container for hot water: boiling water was poured into them from the kettle and then poured from them into teacups or teapots. Several sources recommend the use of pewter vessels in this role, which makes it tempting to identify some of the pewter ewers in the Museum's collection as water pots. We believe that the temptation should be resisted, however. Water pots ceased to be used in Chinese tea making by the mid-16th cen-

tury, and few if any pewter examples have survived. It seems safest to conclude that all of the ewers in question are wine pots, used for serving rice or sorghum liquor in homes and restaurants.

Decorations

Plain pewter is an attractive material, with a dark silvery color when new and a unique, softly mottled gunmetal color after long use. Many pewter caddies and certain other tea wares have unmodified surfaces, depending solely on the play of light over curves and sharp edges for decorative effect. Although high-tin pewter can be buffed to a hard shine, Chinese pewterers seem to have preferred a moderately glossy, light-diffusing surface. The only example of a mirror-like finish seen by the present writers is on an Yixing pewter teapot acquired in Japan; in this instance the shine seems to be due to a thin coat of lacquer.

The alloy lends itself well to surface decoration. It is soft, easily worked, and readily bonded by heating to various other materials—after all, pewter is quite similar in composition to solder. Chinese pewter altar pieces and household items in pewter were sometimes decorated with colored lacquer or inset enamel and porcelain. Pewter tea wares, however, show a more restricted range of decorative techniques. The most important are engraving and soldered appliqué.

Engraving was the main technique used on Yixing hybrid pewter teapots. These invariably have floral motifs on one side, and inscriptions written in cursive or official characters on the other. Many such inscriptions represent calligraphy of a high order, seemingly as fluid as actual brushwork: the softness and lack of grain of the pewter surface made it an almost ideal medium for the graving tool. This no doubt helps to explain the willingness of well-known calligraphers to engage in such work, not to mention the appeal of the teapots themselves to those who were at once lovers of tea and of the literary arts.

Pewter tea vessels of other kinds are also often engraved, but generally in a less elegant fashion. Motifs include simple floral designs and figures of religious or legendary origin. Often the engraved designs were supplemented by applying paper-thin sheets of brass or copper, cut in more or less the same shape as a figure outlined by engraving and then soldered onto the pewter surface within the outlined area. The effect can be highly decorative, offering an attractive contrast between the red or yellow metal designs and the grey metal background (fig. 8). However, the effect tends to be marred by the poor fit between the appliqué and the engraved outlines. One is often reminded of a badly registered color print.

10. **Teapot with overhead handle.** The pewter body is covered with fine, tight-fitting basketry and rests on four small feet; the lid has an ivory knob. This is one of the few pieces in the collection that has been previously published, once as a wine pot instead of a teapot. Impressed seal: "Workshop of Zhang Lihui." Body height 10 cm. Purchased by B. Laufer in Anhui Province and probably made there. 19th century. Gift of E. E. Ayer, 1923. FM 131983 A-110582

Incidentally, one sometimes sees this sheet-appliqué method referred to as "inlaying" in books on Chinese decorative arts. In most cases the term is incorrect, although true inlay is known on

Chinese pewter. Field Museum has several trays with inlaid brass designs (fig. 9), and the British Museum has an extraordinary pewter teapot covered with delicate mother-of-pearl inlay.

We have already seen that jade handles, lid knobs and spouts were usually mounted on the hybrid clay-pewter teapots of Yixing. The pale green or white stone not only formed a pretty contrast with the silvery-grey body, but had a practical function as well. Jade is an excellent insulator. A handle and lid knob of jade therefore kept one's fingers cool when the pot was filled with boiling water. A carefully drilled and sharply cut jade spout must also have made it easier to pour without dripping and may—although no direct evidence on the matter exists — have reassured tea drinkers worried about the toxic effects of contact between hot tea and lead.

A variety of other materials were sometimes used in conjunction with pewter in tea wares. Mention has already been made of teapots with coconut shell and porcelain bodies. Other teapots have lid knobs made of glass, wood, or carnelian. One exceptional teapot—or possibly wine pot—in the Field Museum collection is beautifully wrapped in finely woven basketry, shrink-fitted over the pewter body (fig. 10). While the insulating qualities of the pot may have been somewhat improved by this basketry, one cannot help worrying that repeated wetting would soon have ruined it.

11. Teapot with bucket handles and removable tea basket inside mouth. Pewter. Decorated with engraved floral motifs on a ground of punched circles. An impressed seal on the base reads, "Shantou [Swatow] Branch, Longji, Yanyihe Workshop, Chaoyang [Chaozhou]." Body height 10.5 cm. Early 20th century. Gift of E. E. Ayer, 1924. FM 110000 A-110590

Chinese Pewter Making Centers

Many references to pewter in pre-18th century records direct us to the craftsmen of Mudu in the suburbs of Suzhou City, Jiangsu Province, just across the lake from Yixing. Mudu was also renowned for its artistry in silver, bronze, and wood. No doubt there would have been many exchanges of decorative ideas and techniques. The pewter-working methods used at Yixing may well have come from Mudu. And the Yixing pott-

ers may sometimes have sent clay vessels over to Mudu to be cased in pewter, bringing them back afterward to Yixing for engraving.

The only other Chinese pewter objects in the Museum's collection that have an identifiable place of origin come from somewhere in Anhui, Hunan, and Sichuan Provinces, and from Chaozhou and Canton (Guangzhou) in Guangdong Province. Although little is known about pewter workers in the first three provinces, those of Guangdong, in the Deep South of China, are less obscure. First mentioned in records of the 18th century, they remained leading producers down through World War II because of their access to export markets and to the tin mined in Yunnan and Southeast Asia. They manufactured a wide range of objects, including food warmers, tea caddies, wine ewers, tiered boxes, altar sets, and religious statues.

Pewterers in Chaozhou, some of whom had branch workshops in Shantou (Swatow), often placed their studio marks on their products; recent examples of Chaozhou work (fig. 11) tend also to be identifiable through their very shiny surfaces and rather casual workmanship, which seems much inferior to that of older pieces made in other centers. Some pewter objects made in or near Canton bear the names either of manufacturers or shops, most of them clustered along Denglong Street in Canton city.

The rest of the Museum's pewter is still unprovenanced. Historical records indicate that the alloy was worked at a number of other centers within China: at Ningbo and Shaoxing in Zhejiang Province, at Xiamen (Amoy) in Fujian Province, at Jiaozhou in Shandong Province, and in the city of Shanghai. Craftsmen of Chinese origin also made pewter wares in Southeast Asia, especially in Malaysia and Singapore. And there were undoubtedly still more centers we do not know about. Some of these must be responsible for many of the pewter objects, including those with brass appliqué and basketry decoration, that we have described here. **FM**

Bibliographic Notes

On Chinese Tea Literature

Blofeld, John. 1985, The Chinese Art of Tea. Boston.

Chen Zujian & Zhu Zizhen. 1981, Zhongguo chaye lishizhiliao xuanji [Collections of Chinese writings on tea history]. Beijing.

On Chinese Pewter Wares

Chung, Margaret. 1981, Chinese Pewter: A Research on its History and Development (unpublished manuscript). Department of Art History, University of Chicago.

Hommel, Rudolf P. 1937, China at Work. New York.

Jenyns, Soames & Watson, W. 1980, Chinese Art II: Gold, Later Bronzes, Cloisonne, Cantonese Enamel, Lacquer, Furniture, Wood. New York.

Strachan, Diane S. 1975, "Pewter," Arts of Asia, May-June: 42-46. Hong Kong.

On Yixing Wares

Bartholomew, Terese Tse. 1978, I-Hsing Ware. China Institute of America, New York.

Bartholomew, Terese Tse. 1981, "A Study on the Shapes and Decorations of Yixing Teapots," in Yixing Pottery, pp 13-33. Hong Kong Museum of Art.

Flagstaff Museum. 1984, K.S. Lo Collection in the Flagstaff House Museum of Tea Ware, Part 2. Hong Kong Museum of Art.

Hedley, G. 1937, "Yi-hsing ware," Transactions of the Oriental Ceramic Society: 70-86. London.

Li, Jingkang & Zhang, Hong. 1937, Yangxian shahu tukao [Pictorial study of the teapots of Yangxian], vol. 1. Hong Kong.

Lo, K.S. 1986, The Stoneware of Yixing from the Ming Period to the Present Day. Hong Kong.

Anthropology Symposium for Collectors

Very often private collectors approach Field Museum for information and help with objects in their possession. Our staff can help with some problems and not with others, and we thought that collectors might find it useful and informative to participate in a symposium with Museum Staff about collector's problems.

On Saturday, March 26, from 9 to 12 am, in Lecture Hall I at Field Museum, the Collector's Committee of the Capital Campaign and the Department of Anthropology will present a panel discussion of assistance for collectors. Members of the Anthropology staff will talk about conservation, cataloguing, documentation, collection storage, and display, ethical and legal problems.

Field Museum staff is qualified to speak only about its kind of collections, ethnographic, archaeological, and Oriental art objects, but obviously not about European fine art, historical antiques, European musical instruments, and similar material. These are all matters which are dealt with every day at Field Museum, and perhaps experience gained by the Museum staff in dealing with its collections may be helpful to collectors in dealing with their collections. The duration and format of the meeting will not lend itself to bringing specific objects in for discussion. Phone inquiries and reservations should be made to 322-8862.

"MOTHERS AND DAUGHTERS"

Photographic Exhibit

Closes March 13

Photo by Laura McP
Untitled, 1984
Ringoes, New Jerse
8 × 10 silver gelatin

This unprecedented exhibition of 128 photographs of American mothers and daughters chronicles the first, most lasting, and most crucial bond in every woman's life. Eighty-nine photographers—among them Eudora Welty—have contributed remarkable images that combine to form a varied and deeply insightful vision of the mother/daughter relationship. Large color prints, images combined with text, and mixed-media work are shown side-by-side with more straightforward documentary investigations.

This exhibit was organized by the Aperture Foundation in New York and is free with regular Museum admission.

THE GNETALES

Botanical Remnants From the Age of Dinosaurs

By Catherine D. Hult and Peter R. Crane

For anyone trying to come to grips with the daunting diversity of plant and animal life there is little more disheartening than to discover that organisms as superficially similar as palms and cycads are actually very distantly related, while others as superficially different from one another as cabbages, broccoli, and brussels sprouts are merely variants of a single species. In elementary botany classes a particularly alarming case is presented by a small, peculiar, and somewhat obscure group of plants known as the Gnetales. Although they are currently of little significance in the earth's vegetation, the Gnetales constitute one of only five major groups of living seed plants (the others being cycads, *Ginkgo*, conifers, and flowering plants). As such, they have attracted considerable interest and it is now clear that these unusual outliers in the botanical world are of critical importance for interpreting the evolution of plant life over the last 200 million years.

Today the Gnetales are represented by three living genera which are superficially so different from one another that their close relationship seems almost incomprehensible. The genus *Gnetum* (fig. 1), after which the group is named, mainly includes tropical vinelike climbers that are characterized by large expanded leaves closely resembling those of flowering plants. The similarity of these leaves is so striking (fig. 2) that specimens of *Gnetum* without reproductive parts are regularly misidentified as flowering plants, even by specialists in tropical vegetation. The second genus, *Ephedra* (fig. 3), could hardly be more different, and includes shrubs which typically occur in dry, often more or less arid, situations such as the Mediterranean, Middle East, and southwestern North America. *Ephedra* plants are rarely more than about 15 feet tall, and consist of a mass of spindly stems with minute leaves that are arranged either in pairs or in groups of three. *Welwitschia* (fig. 4), the third member of this peculiar triumvirate, includes a single species which is restricted to a narrow strip of desert in southwestern Africa (see February 1988 *Bulletin*). It is one of the most bizarre plants known and resembles a giant woody carrot with just two thick, leathery leaves which persist throughout the life of the plant.

Neither *Gnetum* nor *Welwitschia* have any very significant utilitarian value, although the flexible fibrous stems of *Gnetum* are used locally in tropical regions for making rope, and young leaves and seeds are occasionally eaten as a vegetable. In contrast, *Ephedra* is widely used in a variety of folk-medicinal applications in many different parts of the world. In western North America during the nineteenth century the stems of *Ephedra* were steeped in water by Indians and frontiersmen to make a stimulant—the so-called "Desert," or "Mormon," tea. In North Africa and Asia preparations of *Ephedra* are used as antiperspirants, antiasthmatics, and also in several gynecological applications. The active principle common to most of these folk-medicinal uses is the alkaloid ephedrine or related compounds, which have the ability to constrict swollen or inflamed blood vessels. Not surprisingly, there is considerable pharmacological interest in these com-

Catherine D. Hult is a laboratory assistant in the Department of Geology and Peter R. Crane is associate curator of Paleobotany.

pounds, and the Natural Products Data Base (NAPRALERT) of the College of Pharmacy, University of Illinois at Chicago, lists over 150 tests in which the pharmacological effects of *Ephedra* extracts have been scientifically assessed. Based on the information gained from folk-medicinal applications and its natural occurrences, ephedrine has now been synthesized artificially and it is one of the common ingredients in various allergy, cold, and asthma medications.

1. Model of part of a *Gnetum* plant showing a shoot with leaves, aborted female "flowers," and about 20 large seeds. The model is currently on display in "Plants of the World" (Hall 29).

The evolutionary and botanical interest in the Gnetales mainly centers on their relationships to each other and to other plant groups. To begin with, one might reasonably ask why these three strange plants are regarded as closely related, given the enormous and obvious differences in form and ecology. The answer is not mysterious, and nicely illustrates both the importance of looking beyond "first impressions" and the normal practice of biological classification (systematics), which classifies plants and animals into groups based on similarities rather than on differences. Quite simply, it would be nonsense, and completely impracticable, to construct groups which were not circumscribed in some way by similar characteristics. Thus, we classify seals, cows, and humans together as mammals in spite of their obvious differences because they all share important common similarities such as the presence of hair and mammary glands producing milk. Based on the presence of these distinctive features we conclude that these animals are closely related.

Exactly the same principles apply in the botanical world. In fact, with Gnetales—if one ignores the obvious features unique to each of three genera—there are many distinctive characteristics which all members of the group have in common. These include their leaf arrangement, certain chemical features, the construction of their reproductive parts, and details of their life cycle. When the complete list is assembled it becomes obvious that the Gnetales share so many unusual—and fundamental—similarities that their close relationship to each other could hardly be in doubt.

One characteristic feature of all Gnetales that has attracted considerable attention is the remarkable specialization of those cells which conduct water from the roots to the aerial parts of the plant. In conifers and *Ginkgo* the long thin cells that perform this function (technically termed tracheids, fig. 5) are also responsible for structural support: literally for holding the tree up. Almost all of the tree trunk in conifers and *Ginkgo* is comprised of tracheids. However, as is often the case in biology, different functional requirements directly

conflict and some kind of compromise appears to have been "worked out" in the course of evolution. In the cellular construction of tree trunks there is a direct conflict between the two equally important requirements of structural support and water conduction. If one were to design the ideal kind of wood for conducting water it would be composed of thin-walled cells, with large internal diameters linked together to form long tubes. In contrast, the ideal wood for structural support would be composed of cells with narrow internal diameters and very thick walls that would fit together as a strong interlocking mass. Thus, an ideal conducting cell would be physically weak and almost useless for structural support, while the ideal, strong, structural cell would have almost no ability to conduct water.

The tracheids of conifers and *Ginkgo*, which are used both for support and water conduction, therefore represent a compromise which balances these conflicting requirements (fig. 5). However, in the Gnetales (and also in flowering plants) the conflict has been neatly avoided, and the two roles of conduction and support are mainly carried out by two different kinds of cells, each specialized for their own function (fig. 5). Tracheids or even thicker-walled cells (fibers) remain the principal source of stem support, but the role of conduction is taken on by specialized cells with perforated end walls (termed vessel elements, fig. 5), which often have a large diameter and are linked together to form long continuous tubes. This remarkable specialization is part of the evidence which indicates that the three living genera of Gnetales are closely related to each other, and that clearly separates the Gnetales (and flowering plants) from all conifers, cycads, and *Ginkgo*.

In terms of evolution, the occurrence of the same specialized features in *Ephedra*, *Gnetum*, and *Welwitschia* has led most botanists to conclude that they probably all evolved from a single common ancestor. Subsequently, each genus seems to have followed a different evolutionary pathway, each becoming uniquely specialized in its own way. The structure and operation of the reproductive system provides a good illustration of how different specializations have apparently been superimposed on a basically uniform "ground plan." In all three genera the structure of the immature developing seed (ovule) is quite similar, and it is surrounded

2. Leaves of *Gnetum gnemon* (left) compared with those of coffee (*Coffea arabica*, right), a representative flowering plant. Note the similar pattern of veins and expanded leaf blade. It has been suggested that the physiological capability to support such leaves may have been enhanced in the course of evolution by the development of efficient water-conducting cells (vessels) in both flowering plants and Gnetales.

and protected by pairs of small leaflike structures (technically termed bracts and bracteoles). However, as the seed matures this basic pattern of organization is modified in various ways as part of different methods of seed dispersal.

In *Welwitschia* the leaflike structures become dry and remain attached to the seed to form a papery wing (fig. 6), and this probably enhances the possibilities for wind dispersal in the barren, open habitats that these plants occupy (fig. 4). In *Ephedra* some of the bracts become swollen (fig. 3), fleshy, and colored (usually bright red). This seems to be important in attracting birds, which inadvertently swallow and distribute the relatively small seeds. *Gnetum* also appears to be animal dispersed, although the seeds are much larger (fig. 1). As in *Ephedra*, the surrounding bracts are usually orange or red and this coloration is apparently associated with dispersal by birds and perhaps some mammals. However, a few species of *Gnetum* stand out as having dull grey seeds and perhaps a quite different dispersal system. Recent studies have shown that species with seeds of this type are often confined to areas which are flooded annually (for example parts of the Amazon Basin).[1] At these times of the year the flood water may rise well over 30 feet, and fish—in a bizarre quirk of nature—become the most widespread animals of the forest. In the process of feeding on floating and submerged fruits and seeds, the fish play an important role in the dispersal of many plants. Based on the most recent observations, at least some of the *Gnetum* species that grow in regularly flooded areas may be among the large group of lowland tropical plants in which dispersal is aided by fish.[1]

3. Shoots of *Ephedra* showing the spindly, jointed stems, small leaves, and the swollen bracts associated with mature seeds.

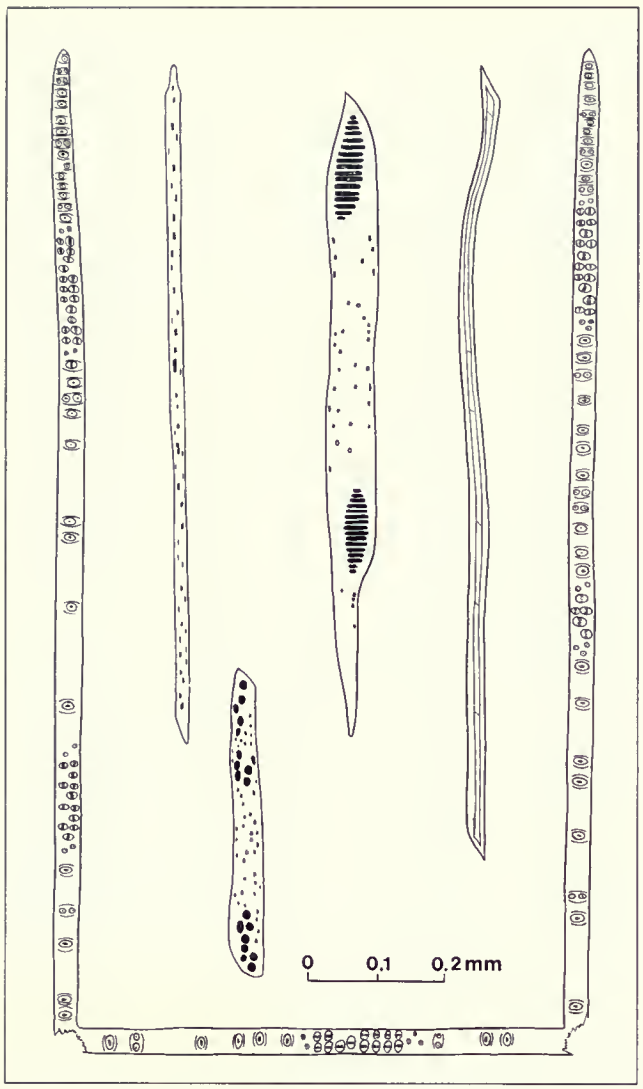
Although many aspects of the biology of the Gnetales are rather poorly understood, another area in which there is some information concerns the way in

4. Part of the diorama in "Plants of the World" (Hall 29) at Field Museum showing *Welwitschia mirabilis* in its natural habitat (see February 1988 *Bulletin*).

which these plants are pollinated. It is generally assumed that the Gnetales—along with cycads, conifers, and *Ginkgo*—are all wind pollinated and that unlike the typical situation in flowering plants, transfer of pollen takes place without the assistance of insects or other animals. However, it has recently been shown that certain cycads are insect pollinated and this also appears to be true of the Gnetales. Some particularly fascinating studies on *Ephedra* have demonstrated at least two kinds of insect pollination systems.[2,3] In some species male and female reproductive organs are produced on separate individuals, and the bracteoles (and even leaves) associated with both the male and female parts (pollen organs and ovules, respectively) produce a sweet nectarlike secretion which is collected by insects (fig. 7).

Other species have female plants, which produce only ovules, and male plants which produce pollen organs as well as "nonfunctional" ovules. In both male and female plants of these species the "nectar" is produced at the tip of a tube which is at the apex of each ovule. Interestingly however the ovules on the male plants never develop into mature seeds and the maintenance of both sex organs in these individuals seems to be tied to the operation of the pollination system. The nonfunctional ovules apparently play a role in attracting insects to the male plants (fig. 7). In both cases the droplet of "nectar" produced resembles honey in having a high sugar and nitrogen content and is collected mainly by hoverflies (syrphids) and other Diptera (true flies).

A basically similar kind of insect pollination mechanism appears to operate in *Welwitschia* (see February 1988 *Bulletin*) and at least some species of *Gnetum*. In *Gnetum gnemon* there are also separate male and female plants, but once again associated with the male reproductive structures are female sex organs (ovules) which never mature into seeds. These ovules also produce a large droplet of liquid at their apex, and again this secretion may be associated with the attrac-



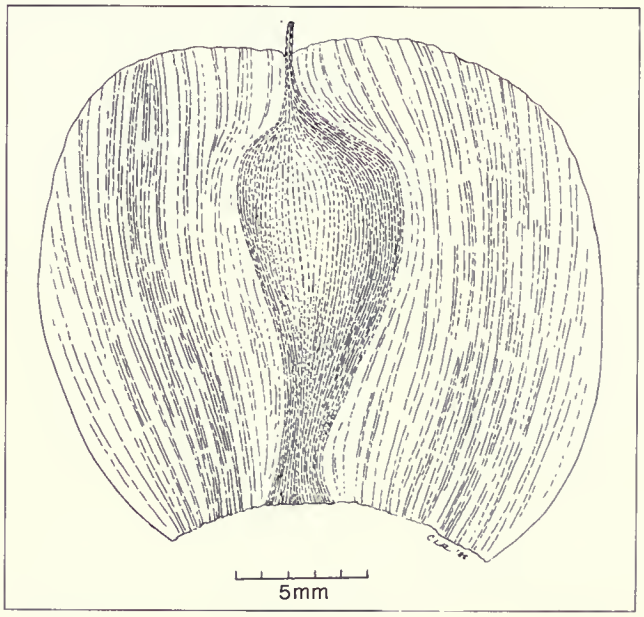
5. Diagrams illustrating the different kinds of structural and water-conducting cells in the stems of conifers, Gnetales, and flowering plants. The long tracheids (folded—left, bottom, right) which make up most of the wood in the trunk of a pine tree (*Pinus*) are important in both physical support and water conduction and thus represent a compromise between these two functions. In the stem of *Ephedra* support is provided principally by long thick-walled, fiberlike tracheids (left of scale, top), while water is mainly conducted through shorter cells with a larger internal diameter and perforated end walls (vessels—left of scale, bottom). Similar differentiation into structural fibers (above scale, right) and water-conducting vessels (above scale, left) occurs in the wood of flowering plants (e.g., *Liriodendron* —tulip tree). Redrawn from diagrams in Esau.[8] Drawings by Clara Richardson.

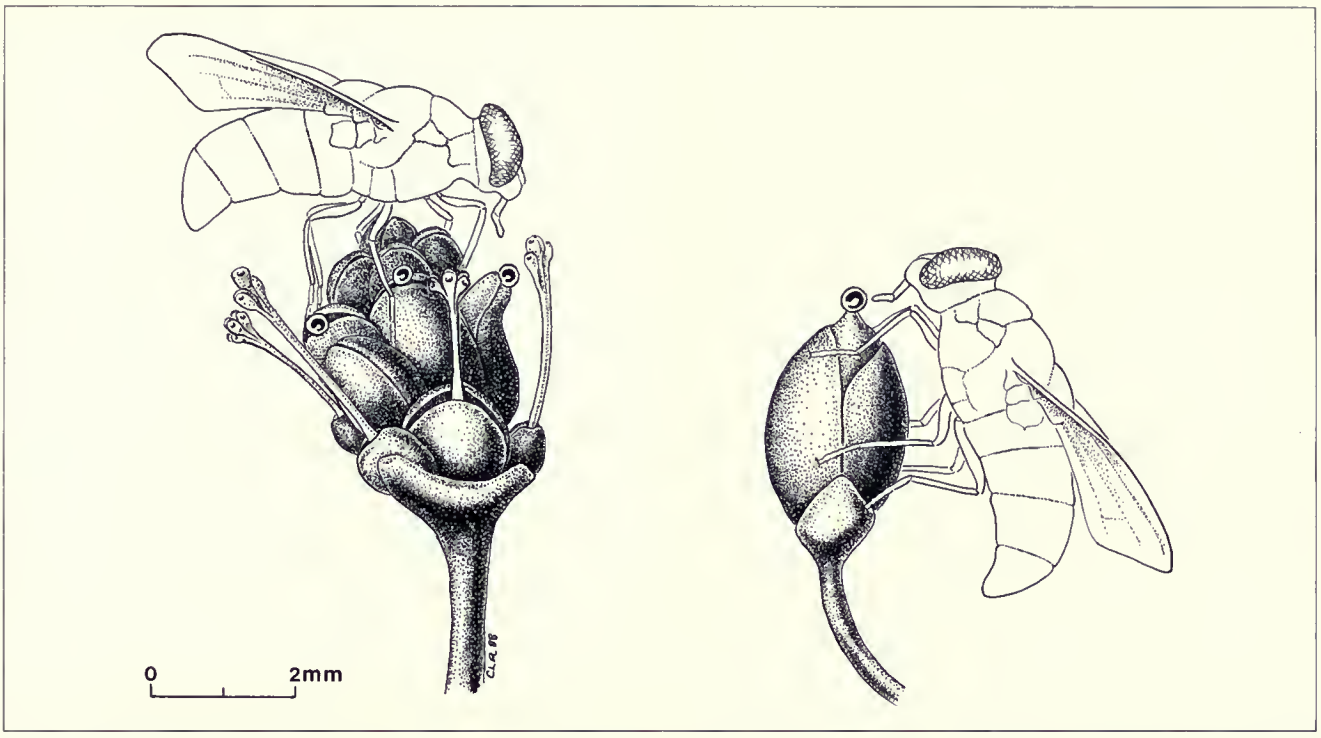
tion of pollinators to male plants (fig. 8). Although there are no detailed studies of pollination in *Gnetum* there are scattered observations that large bees and other insects visit the flowers of some *Gnetum* species.[4]

The small amount of evidence available therefore seems to indicate that at least some Gnetales are insect pollinated. In all three of the living representatives there seems to be evidence that insects are enticed to visit male plants by "nonfunctional" female parts (ovules), which produce a nectarlike substance at their tip. This is especially interesting because in conifers, *Ginkgo*, and probably some cycads a similar secretion produced by the ovule is important in trapping pollen floating in the air currents. This so-called "pollination droplet" is then reabsorbed, "sucking" the pollen back into the ovule. In the Gnetales the function of this secretion seems to have been subtly altered, perhaps as part of an evolutionary shift from wind to insect pollination. In effect, the "pollination droplet" seems to have been coopted, and slightly modified to play a role in attracting insects to the plant. According to recent studies[2,3] this functional shift may also have been accompanied by a change in the chemical composition of the droplet. In *Ephedra* the nectar drop has a higher sugar content than is typical of the pollination droplet in at least some wind-pollinated conifers.

The interest attaching to the existence of insect pollination in the Gnetales is twofold. First, it demon-

6. A mature seed of *Welwitschia mirabilis* with a pair of attached dry leaflike structures (bracteoles), which form the two papery wings. Drawing by Clara Richardson.

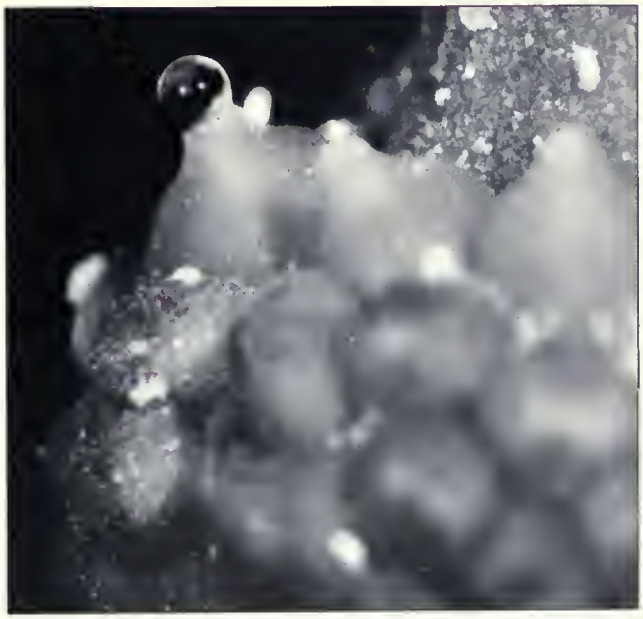




7. A fly (*Lucilia* sp.) feeding on the nectarlike pollination droplet produced at the apex of *Ephedra* ovules. The fly is attracted to pollen producing "flowers" (left) by "nonfunctional" ovules that produce a pollination droplet but never mature into seeds. Fully functional ovules on different plants (right) do not have associated pollen-producing organs. Redrawn from sketches by Seger in Bino et al.[2] Drawings by Clara Richardson.

strates that although there are no large or visually spectacular flowers in the living gymnosperms, at least some of these plants do have relatively sophisticated insect pollination systems. Along with the recently discovered role of insects in the pollination of certain cycads,[5] this realization begins to redress the common (but wrong) view that among living plants only angiosperms (flowering plants) are insect pollinated. Second, it demonstrates an intriguing point of similarity between the Gnetales and angiosperms to be added to the already impressive list of features shared between the two groups. To return to our earlier point, the existence of such similarities raises the obvious question of how the Gnetales and angiosperms might be related in terms of evolution.

The Gnetales have sometimes been called "the lure and the despair" of the plant morphologist, a view alluding both to their unusual structure and the polarized opinions of many botanists who interpret them either as some kind of "missing link" between flowering plants and gymnosperms or as completely irrelevant to the question of angiosperm origins. Early in this century E. A. N. Arber and J. Parkin, working at Cam-



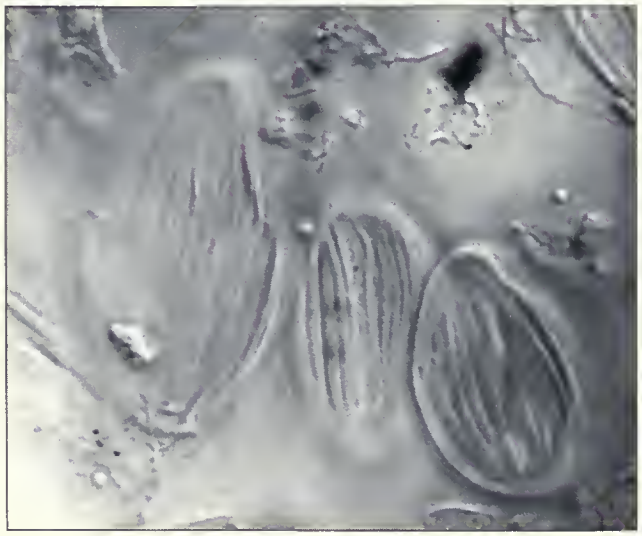
8. Several whorls of reproductive structures in a male plant of *Gnetum gnemon* showing several male (pollen producing) "flowers" below and three nonfunctional female "flowers" (ovule and associated bracteoles) above. Note the large drop of liquid at the apex of one of the ovules. This pollination droplet may function as nectar and play an important role in the attraction of insect pollinators. Photograph by Prof. P. K. Endress.

bridge University, presented several important and highly influential ideas on flowering plant evolution and strongly advocated the view that the Gnetales and angiosperms are closely related. While many of Arber and Parkin's ideas have been widely accepted, their hypothesis of the position of the Gnetales steadily became less popular until the work of I. W. Bailey and his colleagues at Harvard University appeared to deliver the "coup de grace" to this long-standing idea.

Bailey and others presented evidence that the specialized water-conducting elements (vessels) of Gnetales and angiosperms were much less similar than once thought. Because this removed an important point of similarity between the two groups many botanists quickly dismissed the idea of a close relationship between Gnetales and flowering plants. However, other significant similarities still remained and in the last few years the Arber and Parkin idea has been revived. Not only is their view supported by the bulk of accumulated evidence from plant structure and anatomy, but it is also supported by very recent chemical analyses of similarities in their genetic material. Taken together, all of the recent work suggests that the Gnetales are more closely related to angiosperms than to any other living group of seed plants, but it also shows that the Gnetales, at least as they are currently defined, were not the direct ancestors of flowering plants.

10. A fossil shoot of *Drewria potomacensis*, an extinct member of the Gnetales from the Early Cretaceous of Virginia.[7] The specimen is about 7 mm long and poorly preserved, but shows a stem with a pair of attached leaves and the remains of three terminal inflorescences. The oval structures at the top left of the specimen are probably the fossilized remains of seeds (compare fig. 11).

9. Three fossil gnetalean pollen grains from the Early Cretaceous of Virginia.[7] The pollen grains have numerous longitudinal ridges on their surface and closely resemble the pollen of extant *Welwitschia mirabilis*. Each of the two smaller grains is about 20um (20 thousandths of a millimeter) long. These specimens are from the same thin bed of clay as the fossil gnetalean shoot illustrated in fig. 10. Photograph by Dr. G. R. Upchurch.



One puzzling and slightly worrying aspect of this conclusion is that if Gnetales and flowering plants are indeed sister branches on the phylogenetic tree then they might be expected to have similarly long fossil histories. Flowering plants have an excellent fossil record which extends back at least 120 million years, but frustratingly the fossil history of the Gnetales has always been something of an enigma. In the early part of this century, nothing was known of the fossil record of the Gnetales, but Arber and Parkin were quick to recognize the possibility of confusing fossil Gnetales (particularly leaves like those of *Gnetum*) with angiosperms. Other workers[6] have suggested that the Gnetales may have been confined to dry perhaps desert environments, such as those inhabited by *Ephedra* and *Welwitschia*, where the chances of preservation as fossils would have been small. Since Arber and Parkin's work there have been extensive studies of fossil pollen and spores, principally in association with geological exploration for coal, oil, and gas reserves. Such studies have greatly enhanced our understanding of the history of many plant groups, and based on fossil pollen grains (fig. 9) it is now thought probable that the Gnetales may indeed

have a fossil record extending as far back as the Permian[6] (about 250 million years before present).

All other evidence of the Gnetales had eluded paleobotanists until a complete fossil gnetalean plant was recently described from rocks about 120 million years old close to Richmond, Virginia.[7] One of the most striking features of these fossils is their minute size, and that they were ever collected at all is a tribute to the perspicacity of Dr. G. R. Upchurch of the University of Colorado who discovered them (fig. 10). These Cretaceous Gnetales are thought to have been small herbaceous plants (fig. 11) which along with ferns and perhaps a few small flowering plants probably colonized the kinds of open, often disturbed areas that many grasses and other common weeds occupy today.[7] As any gardener knows, it is the trees not the grass which provide most of the work in the fall when huge quantities of fallen leaves need to be gathered up. In contrast, herbaceous plants usually die back and wither where they grow: because they do not shed large quantities of leaves their vegetative parts stand little chance of being washed into lakes, ponds, or the sea and thus being preserved in the fossil record. If most of the extinct Gnetales were herbaceous like the fossil material from Virginia, it may provide part of the explanation for why the fossil record of the Gnetales has remained so sketchy for so long.

Although the fossil record of the Gnetales is still poor it seems certain to be expanded as paleobotanical work continues. Already the evidence from fossil pollen clearly shows that the Gnetales were once much more diverse than their three remaining living representatives would lead us to suspect, particularly in the vegetation of eastern South America and western Africa about 120-100 million years ago. As is often the case with ancient groups, the living representatives are just the tip of the evolutionary iceberg. In this case the three living genera are merely the surviving remnants of a group that reached its zenith well before the demise of the dinosaurs. It is now clear that the Gnetales were once much richer in species and it is in these situations that paleontology makes its special contribution of placing our living, but perhaps biased, sample of plants in an appropriate historical perspective. **FM**

11. Reconstruction of a fossil gnetalean (*Drewria potomacensis*) from the Early Cretaceous of Virginia[7] based on about 100 specimens similar to that in fig. 10. The reconstruction shows pairs of leaves and the terminal aggregations of reproductive structures (compare fig. 10). Drawing by Clara Richardson.

References

1. Kubitzki, K. 1985. Ichthyochory in Gnetum venosum. *An. Acad. Brasil. Ciênc.*, 57(4):513-516.

2. Bino, R. J., A. Dafni and A. D. J. Meeuse. 1984. Entomophily in the dioecious gymnosperm *Ephedra aphylla* Forsk. (*E. alte* C.A. Mey.), with some notes on *E. campylopoda* C.A. Mey. I. Aspects of the entomophilous syndrome. *Proceedings of the Koninklijke Nederlandse Akad. van Wetenschappen*, (C)87(1):1-13.

3. Bino, R. J., N. Devente and A. D. J. Meeuse. 1984. Entomophily in the dioecious gymnosperm *Ephedra aphylla* Forsk. (*E. alte* C.A. Mey.), with some notes on *E. campylopoda* C.A. Mey. II. Pollination droplets, nectaries, and nectarial secretion in *Ephedra*. *Proceedings of the Koninklijke Nederlandse Akad. van Wetenschappen*, (C)87(1):15-24.

4. Van der Pijl, L. 1953. On the flower biology of some plants from Java, with general remarks on fly-traps (species of *Annona, Artocarpus, Typhonium, Gnetum, Arisaema* and *Abroma*). *Ann. Bogor*, 1:77-99.

5. Norstog, K. 1987. Cycads and the origin of insect pollination. *American Scientist*, 75:270-279.

6. Wilson, L. R. 1959. Geological history of the Gnetales. *Oklahoma Geology Notes*, 19(2):35-40.

7. Crane, P. R. and G. R. Upchurch Jr. 1987. *Drewria potomacensis* gen. et sp. nov., an early Cretaceous member of Gnetales from the Potomac Group of Virginia. *American Journal of Botany*, 74(11):1722-1736.

8. Esau, K. 1965. Plant Anatomy. 2nd ed. John Wiley & Sons, Inc., U.S.A. 767 pp.

FIELD MUSEUM TOURS

Dear Field Museum Member:

Whale-watching and observing the varied bird life along the St. Lawrence are just some of the pleasures that await members of our July tour to Canada's Maritime Provinces. These rare experiences will be particularly worthwhile since your group will be accompanied by Dr. David Willard, manager of Field Museum's bird collection and a seasoned tour leader. He most recently led a tour to Alaska.

Our special voyage aboard the magnificent M.V. *Illiria* highlights the incredible natural history and untouched beauty of the Maritime Provinces. In addition to Dr. Willard, a marine biologist on board will discuss the region's remarkable wildlife, while an expert on the history and diversity of our ports-of-call will prepare us for on-shore excursions.

This tour promises to be one of our finest ever, and the fact that we will be cruising on the elegant *Illiria* ensures that this will be a memorable voyage. With its ratio of 90 crew members serving only 135 passengers, the *Illiria* guarantees a high level of personalized service at all times. The superbly furnished ship has gleaming brightwork, broad teakwood decks, a large dining room that accommodates all passengers at a single sitting, and museum-quality artwork. The unique nature of this program, which combines the pleasures of the great outdoors with the luxury and convenience of cruise travel, makes for an ideal summer family vacation. With all sightseeing tours included in the rates and all meals included during the cruise, this program presents an excellent travel value. And, our special "third person sharing rates" enable three or four persons to occupy a single cabin at significant savings—a wonderful opportunity for inviting your children or grandchildren.

Most of all, this tour will afford you the opportunity to view the area's great variety of bird life with the guidance and expertise of a Field Museum specialist.

We have indications that this program will sell out quickly. To avoid disappointment, we encourage you to book your reservation soon.

Sincerely,

Willard L. Boyd
President

M.V. *Illiria*

Voyage to The Gulf of St. Lawrence and Canada's Maritime Provinces

Aboard the *Illiria*
July 1-9, 1988
Accompanied by Dr. David Willard, Field Museum Zoologist

ITINERARY

July 1
Fly to Montreal. Transfer to Delta Montreal Hotel.

July 2
Morning drive to Quebec City; sightsee in the afternoon. *Illiria* sails at 4:00 pm. Evening cruise along the St. Lawrence River shore. Captain's welcome dinner.

July 3
Cruise St. Lawrence River this morning. Whale-watching by Mingan Islands this afternoon. Evening cruise to Newfoundland. Gros Morne National Park.

July 4
Morning arrival at Gros Morne National Park for day of shore excursions. Evening cruise past Bay of Islands and along Newfoundland's south shore.

July 5
Morning arrival at St. Pierre Miquelon for shore excursions. Evening cruise past Grand Miquelon to Magdalen Islands.

July 6
Morning arrival at Magdalen Islands. Afternoon shore excursions. Evening cruise to Gaspé Peninsula.

July 7
Morning visit to Bonaventure Island Bird Sanctuary. Afternoon visit to Percé at tip of the peninsula. Evening cruise up St. Lawrence River shore.

July 8
Whale-watching this morning. Cruise Saguenay River Fjord in the afternoon. Evening cruise to Montreal. Captain's farewell dinner.

July 9
Disembark Montreal after breakfast. Transfer to airport for flight home.

Rates: $2,090-$2,450 per person (double occupancy); third person $430-$550. These rates do not include air fare, but do include a $200 tax-deductible contribution to the Field Museum. Estimated round trip air fare between Chicago and Montreal: $195. To reserve tour space, send $200.00 per person deposit to Field Museum Tours. A brochure will be mailed upon request. Please phone 322-8862 for further information.

For reservations, call or write Dorothy Roder (322-8862), Tours Manager, Field Museum, Roosevelt Rd. at Lake Shore Dr., Chicago, Il 60605

Field Museum of Natural History
Membership Department
Roosevelt Road at Lake Shore Drive
Chicago, IL 60605-2499

MISS MARITA MAXEY
7411 NORTH GREENVIEW
CHICAGO IL 60626

FIELD MUSEUM OF NATURAL HISTORY BULLETIN

April 1988

"Birds in Art"

March 26 - May 22

Field Museum of Natural History Bulletin

Published since 1930 by
Field Museum of Natural History
Founded 1893

Editor/Designer: David M. Walsten
Production Liaison: Pamela Stearns
Staff Photographer: Ron Testa

BOARD OF TRUSTEES

Robert A. Pritzker
Chairman
Mrs. T. Stanton Armour
George R. Baker
Robert O. Bass
Gordon Bent
Mrs. Philip D. Block III
Willard L. Boyd,
President
Robert D. Cadieux
Worley H. Clark
James W. Compton
Frank W. Considine
William R. Dickinson, Jr.
Thomas E. Donnelley II
Thomas J. Eyerman
Marshall Field
Ronald J. Gidwitz
Clarence E. Johnson
Richard M. Jones
John James Kinsella
Robert D. Kolar
Hugo J. Melvoin
Leo F. Mullin
James J. O'Connor
James H. Ransom
John S. Runnells
Patrick G. Ryan
William L. Searle
Mrs. Malcolm N. Smith
Robert H. Strotz
Mrs. Theodore D. Tieken
E. Leland Webber
Blaine J. Yarrington

LIFE TRUSTEES

Harry O. Bercher
Bowen Blair
Stanton R. Cook
Mrs. Edwin J. DeCosta
Mrs. David W. Grainger
Clifford C. Gregg
Mrs. Robert S. Hartman
Edward Byron Smith
John W. Sullivan
J. Howard Wood

CONTENTS

April 1988
Volume 59, Number 4

APRIL EVENTS AT FIELD MUSEUM 3

BIRDS IN ART
March 26-May 22 8

TRADITIONAL SILK SARONGS
Of Mandar, South Sulawesi, Indonesia,
by Robert L. Welsch 13

HYDE PARK'S PARAKEETS
by David M. Walsten 23

FIELD MUSEUM TOURS
Featuring July Voyage to the Gulf of St. Lawrence
and Canada's Maritime Provinces 30

COVER

"Winter Song" — acrylic painting of black-capped chickadees by Jerry Gadamus, of Green Bay, Wisconsin: 97 × 36cm. Gadamus's painting is one of 60 artworks on view from March 26 through May 22. The exhibit, "Birds in Art," was organized and is being circulated by the Leigh Yawkey Woodson Art Museum, Wausau, Wisconsin. For more on the exhibit, see pages 8-12.

Field Museum of Natural History Bulletin (USPS 898-940) is published monthly, except combined July/August issue, by Field Museum of Natural History, Roosevelt Road at Lake Shore Drive, Chicago, IL 60605-

Copyright ©1988 Field Museum of Natural History.

Subscriptions: $6.00 annually. $3.00 for schools. Museum membership includes *Bulletin* subscription. Opinions expressed by authors are their own and d
necessarily reflect the policy of Field Museum. Unsolicited manuscripts are welcome. Museum phone: (312) 922-9410. Notification of address change should include address label and be sent to Memb
Department. Postmaster: Please send form 3579 to Field Museum of Natural History, Roosevelt Road at Lake Shore Drive, Chicago, IL 60605-2496. ISSN: 0015-0703. Second class postage paid at Chicago, Illino
additional mailing office.

EVENTS

Edward E. Ayer Series

Thursdays in April, Beginning April 7
1:30 p.m., James Simpson Theatre
Lectures are free and refreshments are served.

April 7
"The Gardens of Japan"
Taimi Anderson, Landscape Architect

The Japanese garden is a garden for all seasons in which serenity, harmony, and beauty combine to express an eloquent abstraction of nature. See how weathered rocks, gnarled pines, waterfalls, and Japanese flora are delicately balanced to symbolize the mountain and island landscape of Japan.

April 14
"Animal Courtship"
Paul Verrell, Research Fellow,
Department of Biology, University of Chicago

Animals court and mate in hundreds of thousands of ways, from the violent praying mantis, who devours her mate after mating, to the romantic lifetime bonding of the Canada geese. Sexual reproduction appears to be an obvious fact of nature, but why and how have animals evolved such diverse means to ensure their survival?

April 21
"A Botanical Sojourn in Switzerland"
Peter Crane, Associate Curator,
Department of Geology, Field Museum

From the gardens of Zurich to the alpine meadows, the visual beauty of Switzerland astounds the visitor. Botanists delight in its diverse and colorful native flora.

April 28
"The Queen Charlotte Islands"
Roy Taylor, Director, Chicago Botanic Garden

Off the coast of British Columbia in the north Pacific lies the homelands of the Haida people, one of the many artistically rich Indian cultures of the Northwest. The Queen Charlottes also support unusual plant life. Explore the vast human and natural beauty of these remote islands.

Adult Programs

Classes

LEARN ABOUT CHINESE CULTURES, capture nature in watercolors or become an expert birder. Adult courses continue through April and May with exciting new six-week, three-week, and one-day classes. Check the April/May Adult and Family Programs brochure or call (312) 322-8855 for program details.

April Weekend Programs

EACH SATURDAY AND SUNDAY you are invited to explore the world of natural history at Field Museum. Free tours, demonstrations, and films related to ongoing exhibits at the Museum are designed for families and adults. Listed below is one of the numerous activities each weekend. Check the activity listing upon arrival for the complete schedule and program locations. The programs are partially supported by a grant from the Illinois Art Council.

April 10
2:00pm *Malvina Hoffman: Portraits in Bronze* (slide lecture). A look at the life and works of Malvina Hoffman, concentrates on the "Portraits of Mankind" collection.

These programs are free with Museum admission and tickets are not required.

Film Series

Art and Artisans: A Celebration of the Margaret Mead Film Festival

Saturdays, April 9 through 30

TO CELEBRATE the tenth anniversary of the Margaret Mead Ethnographic Film Festival, a collection of some of the finest films shown in the festival is on tour. The collection focuses on films depicting the lives and works of traditional artists.

The eleven films in the series are arranged into four thematic programs. Each program features a guest speaker addressing the program's theme.

Saturday, April 9
Women and Cultural Continuity

"Sabina Sanchez—The Art of Embroidery"
Judith Bronowski and Robert Grant
1976, Color, 22 minutes

This film records the peaceful world of a Zapotec woman in San Antonio Castillo, Velasco, Mexico. Sabina embroiders the colorful blouses of her traditional village costume.

Continued ▷

EVENTS

Saturday, April 23
Reviving Ancient Traditions

"Stilt Dancers of Long Bow Village" (above)
Carma Hinton and Richard Gordon
1980, Color, 28 minutes

Saturday, April 9

"Munni: Childhood and Art in Mithila"
Ray Owens, Ron Hess, and Cheryl Graff
1983, Color, 28 minutes

Follow the life of Munni, an 11-year-old girl growing up in the Indian village of Jitwarpur, as she apprentices to become a Mithila artist.

"Quilts in Women's Lives: Six Portraits"
Pat Ferrero
1980, Color, 28 minutes

In "Quilts In Women's Lives," seven women—among them a California Mennonite, a black Mississippian, and a Bulgarian immigrant—demonstrate their art and describe the inspirations for their work: family, tradition, the joy of the creative process, the challenge of design.

Guest Speaker: Elizabeth Fernea, senior lecturer, Center for Middle Eastern Studies, Department of English and University of Texas—Austin.

Saturday, April 16
Music and Dance in Society

"Learning to Dance in Bali"
Gregory Bateson and Margaret Mead
Filmed 1936-39, edited and completed 1978,
black and white, 7 minutes

This brief film, edited and completed in 1978, uses fieldwork footage taken in Bali 50 years ago by pioneer anthropologist-filmmakers Gregory Bateson and Margaret Mead.

"Songs of the Badius"
Gei Zantzinger
1986, Color, 33 minutes

This film documents the post-independence resurgence of the explosive music and dance practiced on the Cape Verde island of Santiago by the "Badius," descendants of runaway African slaves.

"Mountain Music of Peru"
John Cohen
1984, Color, 60 minutes

Sensual, sometimes hallucinatory cinematography characterizes this breathtaking documentary portrait of the centuries-old musical culture of the Andes.

Guest Speaker: Emilie DeBrigard, director, FilmResearch, Higganum, CT.

EVENTS

Saturday, April 23
Reviving Ancient Traditions

"Stilt Dancers of Long Bow Village"
Carma Hinton and Richard Gordon
1980, Color, 28 minutes

"Stilt Dancers of Long Bow Village" focuses on a vibrant dance performance at a country fair in provincial China.

"Our God the Condor"
Andy Harries and Paul Yule
1987, Color, 30 minutes

This extraordinary film, shot in and around the remote village of Cotabamas in the southern Andes of Peru, documents the annual reenactment of the "Yawar Fiesta," an elemental representation of the Indians' triumph over the Spaniards depicted in dance and song.

"Joe David: Spirit of the Mask"
Jennifer Hodge and Robert Lund
1982, Color, 24 minutes

Told in his own words, "Joe David: Spirit of the Mask" offers articulate commentary on the life and work of this Native American sculptor.

Guest Speaker: Dwight Conquergood, assistant professor, Department of Performance Studies and Communication Studies, Northwestern University.

Saturday, April 30
Portraits of the Individual Artist

"Steady as She Goes"
Robert Fresco
1981, Color, 26 minutes

George Fulfit has built 136 miniature ships in bottles since 1970. "Steady as She Goes" documents the building of the 137th, his largest ship to date.

"Imaginero"
Jorge Preloran
1971, Color, 52 minutes

A religious-image maker living on the high Argentine plateau, Preloran works in self-imposed isolation, driven to keep alive forms of traditional religious art he feels the world has forgotten.

Guest Speaker: Tom Palazzolo, documentary filmmaker and professor, Film Department, Art Institute of Chicago.

This film series is organized and circulated by the American Federation of Arts and is supported by funds from the National Endowment for the Humanities and the New York State Council on the Arts.

Saturdays, 1:00pm-4:00pm
April 9-30, (4 sessions)
AC88215 Entire Series - $25 ($15 members)
AC88216 Single Session - $7 ($5 members)

For further ticket and schedule information, call (312) 322-8855 or check the April/May Adult and Family Program brochure.

Registration

Be sure to complete all requested information on this ticket application. If your request is received less than one week before the program, tickets will be held in your name at the West Entrance box office. Please make checks payable to Field Museum. Tickets will be mailed upon receipt of check. Refunds will be made only if the program is sold out.

Name _____

Address _____

City _____ State _____ Zip _____

Telephone: Daytime _____ Evening _____

☐ Member ☐ Nonmember

American Express/Visa/MasterCard

Card Number _____

Signature _____ Expiration Date _____

Return complete ticket application with a self-addressed stamped envelope to:

Field Museum of Natural History
Public Programs: Department of Education
Roosevelt Road at Lake Shore Drive
Chicago, IL 60605-2497

Program	#Member Tickets	#Nonmember Tickets	Total Tickets	Amount Enclosed
Art and Artisans Film Series (entire series) AC88215				
Art and Artisans Film Series (single session) AC88216				
			Total	

☐ Scholarship requested

EVENTS

Films

Saturday, April 16
Music and Dance in Society

"Mountain Music of Peru"
John Cohen
1984, Color, 60 minutes

Sensual, sometimes hallucinatory cinematography characterizes this breathtaking documentary portrait of the centuries-old musical culture of the Andes.

Please use coupon

Now available from the Division of Publications—

Studies in Neotropical Mammalogy

Essays in Honor of Philip Hershkovitz

Edited by

Bruce D. Patterson and Robert M. Timm

CONTENTS

A Biographical Sketch of Philip Hershkovitz, with a Complete Scientific Bibliography, by *Bruce D. Patterson*

History of the Recent Mammalogy of the Neotropical Region from 1492 to 1850, by *Philip Hershkovitz*

A New Superfamily in the Extensive Radiation of South American Paleogene Marsupials, by *Rosendo Pascual and Alfredo A. Carlini*

An Additional 14-Chromosome Karyotype and Sex-Chromosome Mosaicism in South American Marsupials, by *Milton H. Gallardo and Bruce D. Patterson*

Notes on the Black-Shouldered Opossum, *Caluromysiops irrupta*, by *Robert J. Izor and Ronald H. Pine*

Feeding Habits of the Opossum (*Didelphis marsupialis*) in Northern Venezuela, by *Gerardo A. Cordero R. and Ruben A. Nicolas B.*

Notes on Distribution of Some Bats from Southwestern Colombia, by *Michael S. Alberico*

Distributional Records of Bats from the Caribbean Lowlands of Belize and Adjacent Guatemala and Mexico, by *Timothy J. McCarthy*

New Species of Mammals from Northern South America: Fruit-Eating Bats, Genus *Artibeus* Leach, by *Charles O. Handley, Jr.*

Seasonality of Reproduction in Peruvian Bats, by *Gary L. Graham*

Tent Construction by Bats of the Genera *Artibeus* and *Uroderma*, by *Robert M. Timm*

Comparative Ultrastructure and Evolutionary Patterns of Acinar Secretory Product of Parotid Salivary Glands in Neotropical Bats, by *Carleton J. Phillips, Toshikazu Nagato, and Bernard Tandler*

Distribution of the Species and Subspecies of Cebids in Venezuela, by *Roberta Bodini and Roger Pérez-Hernàndez*

Host Associations and Coevolutionary Relationships of Astigmatid Mite Parasites of New World Primates. I. Families Psoroptidae and Audycoptidae, by *Barry M. OConnor*

Notes on Bolivian Mammals. 2. Taxonomy and Distribution of Rice Rats of the Subgenus *Oligoryzomys*, by *Nancy Olds and Sydney Anderson*

New Records and Current Status of *Euneomys* (Cricetidae) in Southern South America, by *José L. Yáñez, Juan C. Torres-Mura, Jaime R. Rau, and Luis C. Contreras*

Morphological Variation, Karyology, and Systematic Relationships of *Heteromys gaumeri* (Rodentia: Heteromyidae), by *Mark D. Engstrom, Hugh H. Genoways, and Priscilla K. Tucker*

Species Groups of Spiny Rats, Genus *Proechimys* (Rodentia: Echimyidae), by *James L. Patton*

An Assessment of the Systematics and Evolution of the Akodontini, with the Description of New Fossil Species of *Akodon* (Cricetidae: Sigmodontinae), by *Osvaldo A. Reig*

Biogeography of Octodontid Rodents: An Eco-Evolutionary Hypothesis, by *Luis C. Contreras, Juan C. Torres-Mura, and José L. Yáñez*

Population Dynamics and Ecology of Small Mammals in the Northern Chilean Semiarid Region, by *Peter L. Meserve and Éric Le Boulengé*

Demography and Reproduction of the Silky Desert Mouse (*Eligmodontia*) in Argentina, by *Oliver Pearson, Susana Martin, and Javier Bellati*

Baculum of the Lesser Andean Coati, *Nasuella olivacea* (Gray), and of the Larger Grison, *Galictis vittata* (Schreber), by *Edgardo Mondolfi*

Origin, Diversification, and Zoogeography of the South American Canidae, by *Annalisa Berta*

Comparative Cytogenetics of South American Deer, by *Ángel E. Spotorno, Nadir Brum, and Mariela Di Tomaso*

Faunal Representation in Museum Collections of Mammals: Osgood's Mammals of Chile, by *Bruce D. Patterson and Clare E. Feigl*

Fieldiana: Zoology
New Series, No. 39
Publication No. 1382
496 pages + Taxonomic and Subject Indices
$35.00 + appropriate tax and/or shipping charges

BIRDS IN ART

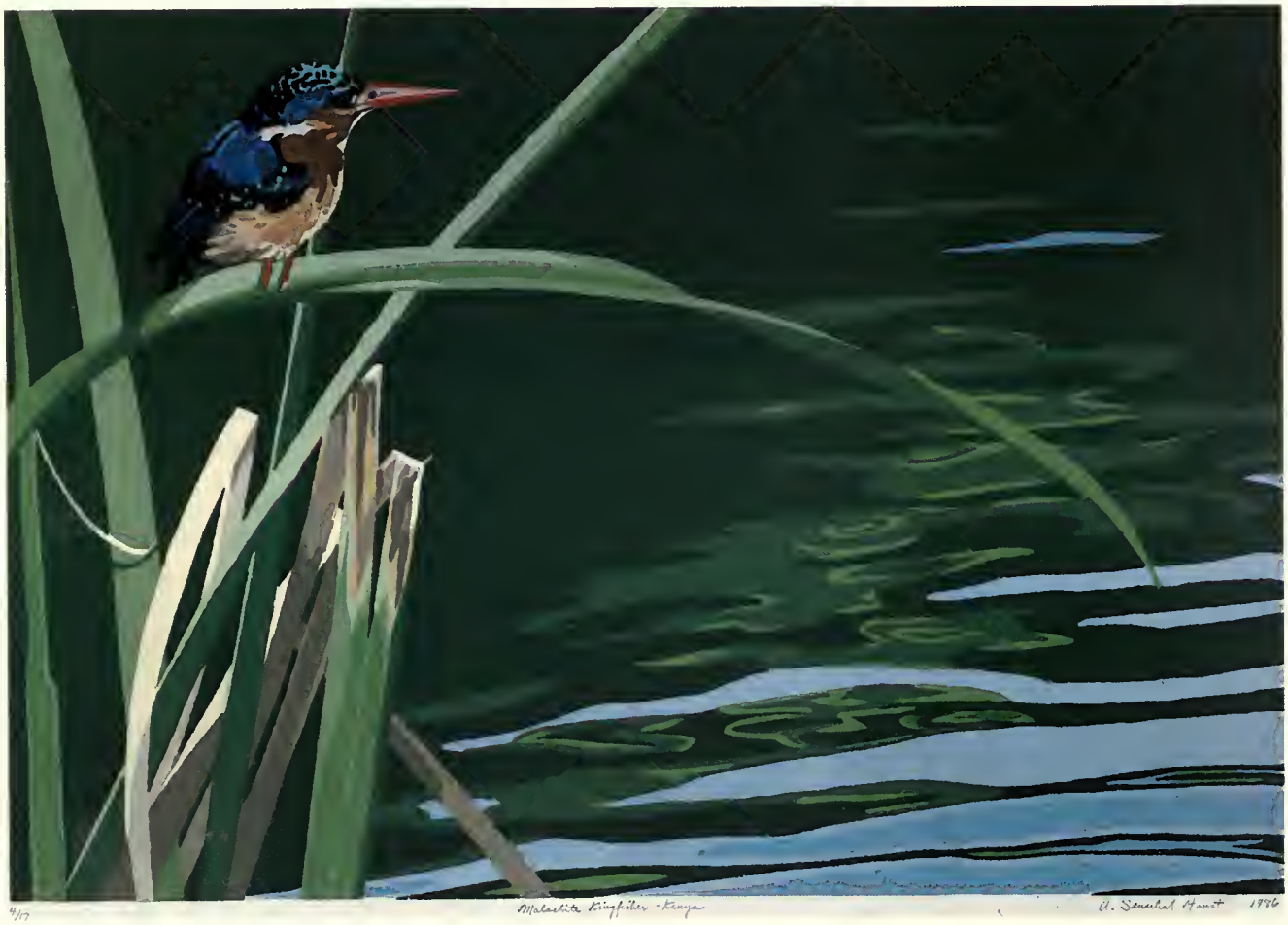
March 26 to May 22

"THE BEST ANNUAL BIRD ART EXHIBIT in the Western Hemisphere" consisting of 60 pieces, includes works by Roger Tory Peterson, Owen Gromme, and the 1987 Master Wildlife Artist, sculptor Kent Ullberg.

"Birds in Art" is a juried show, organized and circulated by the Leigh Yawkey Woodson Art Museum of Wausau, Wisconsin. The exhibit at Field Museum is made possible through the generosity of The Rice Foundation. Each year hundreds of artists from the United States and other countries compete to have their work accepted for the prestigious exhibit. This year's traveling show includes oils, watercolors, gouaches, acrylics, printed graphics, and sculptures in wood, stone, brass, and steel, all depicting birds and their habitats.

The show not only presents a range of techniques and media, but touches on concerns of naturalists, scientists, and conservationists. A number of the artists have worked for natural history museums or other nature organizations. Their artwork reflects a deep-rooted interest and commitment to nature.

"Birds in Art" is accompanied by a 125-page catalog that includes color photos of most pieces in the show. The catalog and a handsome exhibit poster are available at the Museum Store, as well as a selection of bird-motif merchandise. "Birds in Art" is free with regular Museum admission.



"In the Rainy Season—Toco Toucan"
Acrylic, 1987, 43 × 56cm
by Richard Sloan

"Malachite Kingfisher—Kenya"
Serigraph, 1986, 36 × 51cm
by Anne Senechal Faust

"Tundra Watch"—Snowy Owl
Oil, 1986, 51 × 91cm
by Rod Frederick

"Great Egret and Purple Gallinule"
Tempera, 1984, 75×32cm
by Arthur B. Singer

BIRDS IN ART

"Scarlet-and white Tanager"
Watercolor, 1986, 43 × 28cm
by Dana Gardner

Traditional Silk Sarongs Of Mandar, South Sulawesi, Indonesia

by Robert L. Welsch

Married noble women attending a royal wedding wearing blue *baju bodo'* and red sarongs that mark their noble birth. Majene, 1986.

Although nearly everyone has heard about Indonesian batik, few have ever heard about an even older textile tradition found among the Mandar people of Sulawesi, the large spider-armed island in eastern Indonesia formerly called the Celebes. Nearly one-half million Mandar live on the west coast of South Sulawesi. Together with their more numerous neighbors, the Bugis, Mandar people are known throughout Indonesia and Malaysia for their hand-woven textiles, especially their cotton and silk sarongs.

The English word "sarong" is derived from the Indonesian or Malay word *sarung,* which refers to a single piece of cloth sewn into a tube and worn as a kind of skirt. Wrapped around the waist, it is fastened without pins or belt by rolling a few inches of fabric under at the top or with a neat tuck at the side. This simple, loose-fitting garment has been the traditional clothing of both men and women throughout Indonesia and much of Southeast Asia for centuries, and probably came to

---

Robert L. Welsch is a research associate in the Department of Anthropology and conducted 16 months of field research in Mandar (1985-87) on a Fulbright Southeast Asian Research Fellowship. While in South Sulawesi, Dr. Welsch made a collection of Mandar material culture numbering over 450 specimens, including the largest collection of Mandar textiles in the United States.

Indonesia from Hindu India early in the Christian era.

In the public side of daily life, sarongs have now largely given way to trousers for men and dresses for women. But comfortable cotton sarongs are still the most popular kind of casual clothing around the house and as sleep wear. For Muslims (90 per cent of all Indonesians are Muslim) cotton sarongs are the garment of choice for daily prayers. They are the preferred clothing at a *kenduri*, or *selamatan*, a ritual meal with friends and neighbors to thank God for good fortune or to pray for the dead. And on Fridays, Muslim men nearly always wear a white or light-colored cotton sarong and a black cap, a *songko'*, to attend sabbath exercises at the mosque.

On festive occasions, such as weddings and Islamic holidays, Mandar people like Muslims everywhere in south Sulawesi put on their finest attire, which inevitably means their best silk sarong. These hand-woven silks may be bold plaids; small, discrete checks; vibrant stripes; or solids with geometric or floral designs. Whether the colors are brilliant or subdued, silk sarongs add luster and a daring array of hues to an already spectacular display of color.

In spite of the tropical climate, the well-dressed Mandar man wears a jacket or blazer over his silk sarong at any of these formal occasions. Nowadays such jackets usually follow Western styles, but this is simply a modern adaptation on the traditional Mandar jacket of black cloth with a high collar, long sleeves, and buttons down the front. Jacket, sarong, *songko,'* and sandals continue to be mandatory formal wear in Mandar as it has for centuries.

To complement their silk sarongs, most Mandar women prefer to wear a traditional style of blouse, either the loose-fitting *baju bodo'* of gauze or the tight-fitting *baju poko'* of velvet with a high collar. To finish the formal costume, they put their hair up in a tight bun and wear gold jewelry, particularly a distinctive kind of earring or heavy gold post, called *dali* in Mandarese, which is usually set off with honeysuckle flowers.

Muslim men praying during services for Lebaran, the major religious holiday, wearing formal attire that includes a variety of different sarong motifs. Majene, 1986.

Traditional Mandar silks are finely woven taffetas. The most typical motifs are simple plaids on a black, dark reddish-brown, or red background. Mandar plaid motifs (called *sure'*) are symmetrical and spaced at regular intervals on the solid background. Some designs incorporate an additional design element (the *tole'*) that is usually simpler than the *sure'* and serves as a counterpoint to the main motif. The spacing and arrangement of the motif in the body of the sarong is the same along both the warp and the weft, which produces the plaid.

One distinctive feature of every sarong is its back panel ("head," or *pucca'*), which contrasts with the body of the sarong. This panel preserves the *sure'* along the warp, but substitutes alternating thick and thin

white lines along the weft. Sometimes, depending upon the motif, the background color of this panel differs from the main background as well. The presence of the *pucca'* panel is the distinctive feature that distinguishes fabric woven for a sarong from ordinary cloth.

The subdued traditional colors of the background were formerly obtained from vegetable dyes, especially indigo (from which black, dark blue, light blue, and grey were obtained) and several tree resins which provided reddish hues. Although imported aniline, or chemical, dyes have been available since at least the early 19th century, Mandar weavers preferred natural dyes, which unlike many of the aniline dyes were colorfast and tended not to fade even after many years.

To the casual Western observer, Mandar plaids may resemble Scottish tartans, but Mandar motifs have no historical connection with their European woolen counterparts and represent an independent local development.

The numerous motifs available are not associated with particular families as Scottish tartans are, but mark rank, privilege, and social position. Each of the nine or ten oldest motifs have dark or subdued color schemes that Mandar associate with respect and authority. More recently introduced pastels, tiny checks, and brilliant solids suggest less authority and a youthful lack of responsibility. Thus, they are preferred by young people, especially unmarried men and women who are trying to attract the attentions of the opposite sex. Older people tend to wear somber colors, befitting the authority and social position that comes with age.

Several motifs are reserved exclusively for men and women of the nobility. This noble privilege was jealously guarded in the highly stratified and status-conscious Mandar society. In the past if a noble saw a commoner wearing one of these designs he could, with impunity, rip the sarong off the offender in the middle of the road or wherever he happened to be.

Nobles were not limited to these aristocratic motifs, but could wear any design they desired, depending upon their mood and the self-image they wanted to project. A middle-ranking noble might choose to wear bright and flamboyant colors at a commoner's wedding, but prefer a more respectful sarong at a wedding in his own family where he was one of the hosts. Similarly, he might wear festive colors to attend a *malolang* (a kind of bachelor party at the bride's home the night before a noble's wedding), while the groom, as guest of honor, would be expected to wear a more somber motif.

In a similar way, the blouses women wear with

Two young men in ordinary formal attire: silk sarong, jacket, *songko'*, and sandals. Majene, 1986.

their sarongs indicate their marital status and position within the community. Only unmarried women should wear the velvet or velveteen *baju poko'*, though if they prefer they may wear a bright red *baju bodo'*. Red is considered the most alluring color for women, and any young woman wanting to attract the attention of young suitors will always choose to wear red. By the same token, married women should wear a blue gauze *baju bodo'*, while widows should wear white, and divorced women deep green. Each of these blouses should be worn with a sarong appropriate to the woman's rank and social position.

For men, the way the sarong is tied indicates marital status and social rank. Ordinarily, the sarong extends from the waist to the ankles. Single men should wear the *pucca'* panel on their right side. Older and married men should wear it centered at the back. Office holders in the government of the traditional Mandar kingdoms (or their representatives) wore long black trousers and tied their sarongs so they covered only their midsection. Different ranks within the government were entitled to tie their sarongs in slightly different ways as a prerogative of their status. To further indicate their official role they carried a large *kris* (sword or knife) tucked in their sarong, and wore a special gold-rimmed cap *(songko' biring)*. These styles of dress were forbidden to commoners with one exception: when a man marries. As the groom, even a commoner is entitled to wear the gold-rimmed *songko'* and tie his sarong around his midsection. This is because on his wedding day the groom is said to be "*raja,* or prince, for the day."

Mara'dia (prince) arriving at a royal wedding wearing traditional high-collared jacket and songko' of high office, with sarong around his midsection. He is holding his kris (wrapped in his sarong). Majene, 1986.

Sarong vendors in the open-air market (*pasar*) at Tinambung, the major silk-weaving center in Mandar. Tinambung, 1986.

Since the formal abolition of traditional kingdoms by the Indonesian government in the 1960s, these codes of dress are less strictly observed than before. Nowadays commoners even wear the motifs of nobility, usually in an attempt to give the impression of a somewhat higher status than they might be entitled to,

Women in a royal wedding procession. Majene, 1986.

though it would still be considered presumptuous and in poor taste for any commoner to do so at a noble's wedding. Nevertheless, while there is somewhat more flexibility in formal attire than previously, the careful observer can still see what impressions people are trying to make with the sarongs they wear and how they wear them.

Mandar silk sarongs achieved their excellent reputation throughout Indonesia because of several extraordinary qualities. Their dark colors do not run and can be washed. In addition, well-made Mandar silks were so fine that a finished sarong could be pulled through a diameter as small as a wedding ring and afterwards folded up into a small bundle that could fit into a pocket. The best of these, nearly always made for the local nobility rather than for export, were so tightly woven that they could even hold water.

Mandar sarongs are hand-woven at home on back-tension looms, whose basic design has changed very little in over two centuries. The design includes a wooden back brace that rests on the weaver's hips and allows her to apply tension to the warp threads that are strung between a breast beam (in her lap) and a warp beam (near her feet). By leaning backward or forward she can apply just the right amount of pressure to the fabric and thus control loom tension.

The loom relies upon a "comb" to keep the warp threads at regular intervals and in the proper order. For cotton sarongs these combs usually have 30 to 40 openings per inch, but for fine silk they may have more than

Young noble women dancing at a royal wedding, wearing traditional sarongs, *baju bodo'*, and gold jewelry. Majene, 1986.

Kindo Buki prepares a skein of silk yarn for dying. Manjopai village, 1986.

Young woman twists three filaments of silk (right) to make a single strand of 3-ply yarn (on the bobbin in front of her). Other bobbins of silk yarn are soaking in the bowl. Camba-camba village, 1986.

70. Using a bamboo bobbin case as a shuttle, the weaver passes the weft thread through the warp and taps it tightly into place by striking the sword or beater against the comb. After shifting the warp, the process is repeated, with the weft shot through from the other side to produce an extremely tight weave.

These combs are hand-crafted exclusively in Napo, a Mandar village that has long specialized in producing combs for weavers throughout Mandar. The teeth in the comb are made from a wild-growing cane that is very finely split. The split cane is cut into two-inch lengths and tied into place with fine cotton thread to give the desired spacing between the teeth. Although similar combs are made elsewhere in South Sulawesi, Mandar weavers insist that only combs made in Napo have the high quality they require for their weaving.

Mandar import raw silk from overseas, but process the silk yarns themselves, using several simple hand-crank machines that resemble spinning wheels. This five-step process does not actually spin the silk but twists the silk filaments together to make a serviceable yarn. From two to five filaments are wound and lightly twisted together onto small bamboo bobbins and soaked in water overnight. Then the silk is transferred onto a large bamboo spool and wound into neat skeins, which are then boiled to produce a soft, lustrous, white yarn. After drying, the yarn is ready to be dyed.

The thickness of silk fabric is determined by the number of silk filaments that are twisted together to make the yarn. A two-ply yarn produces a very fine, wispy fabric, while a three-ply yarn yields a heavier but more durable silk. Because the three-ply yarn requires more raw silk, it has a soft but crisp feel and makes a gentle rustle as one walks. These heavier silks, the most popular in Mandar today, are the more expensive.

The warp, which is about five yards long and two feet wide, is strung by hand. Each strand of yarn must be threaded through the comb and around the various separator rods. Taking 8 to 12 hours to complete, this task is usually done by teenage girls or young women, because it demands a good eye to insert the thread through the fine openings of the comb. If the motif is a complex one, the weaver changes colors frequently, paying extremely close attention to the exact number of threads of each color so as not to introduce an error in the design. The warp is a fixed arrangement of threads that are attached to both the comb and the separator rods; thus, mistakes in the design cannot be corrected once the warp is complete.

Four yards of the warp are wound carefully around

Above: Kanne Nauri, one of the last surviving Mandar dyers, using indigo to dye silk. To obtain a true black color, the silk must be dipped in the ceramic vat of indigo and dried each day for at least ten days. Camba-camba village, 1986.

Above, right: Young girl making the warp. Here she threads the silk yarn through the comb. Pambusuang, 1986.

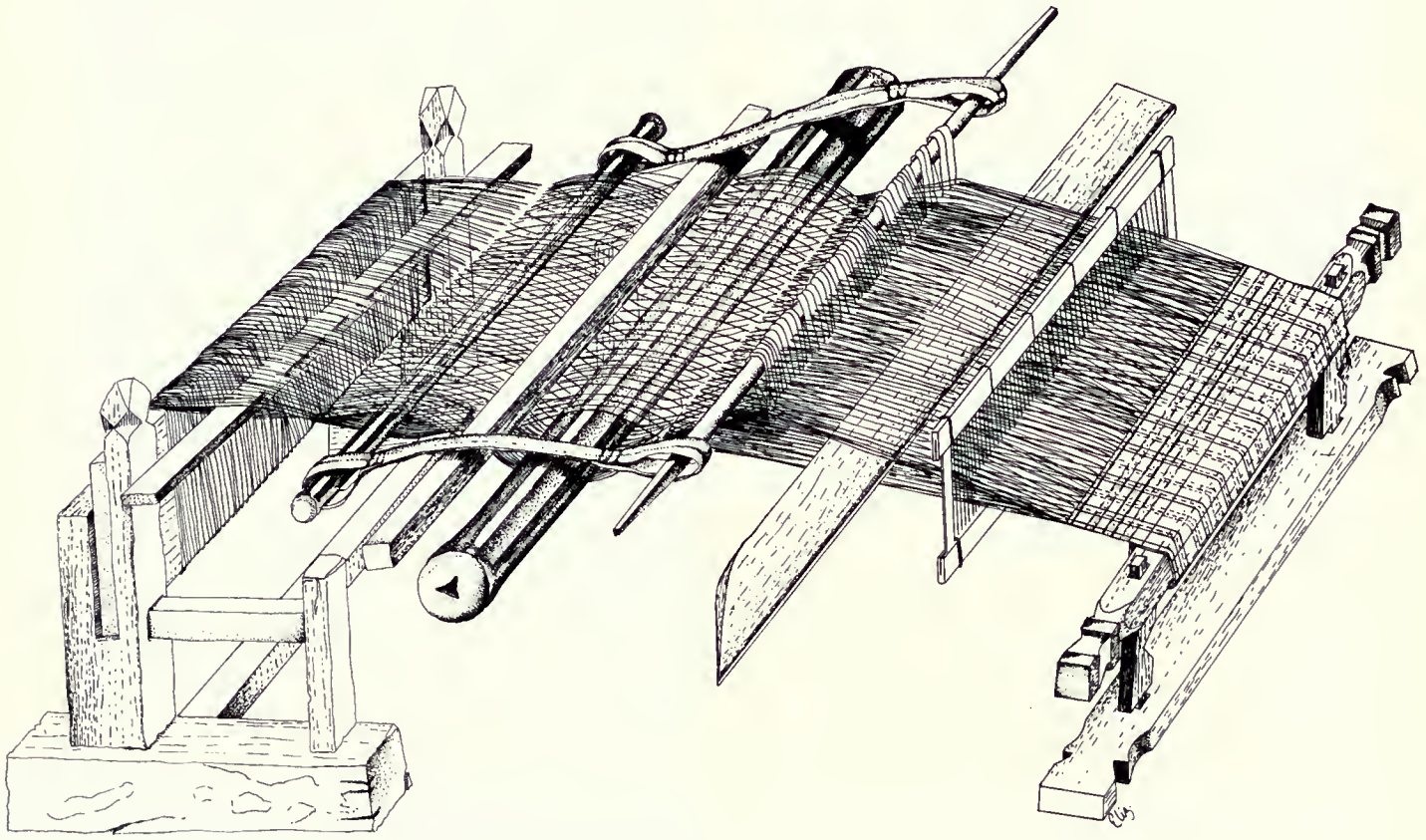
Right, center: Kindo Buki weaving a silk sarong with a traditional Mandar motif. Manjopai village, 1986.

Below: Amma'na Ika weaving a silk sarong with a brightly colored modern motif. Luaor village, 1986.

the warp beam and placed in a frame on the floor at the weaver's feet, while the other end of the warp is attached to the breast beam that sits on her lap. Seated on the floor with her feet stretched out in front of her, the weaver shoots the weft thread first from right to left, taps it into place with her comb and sword, adjusts the heddle (which guides the warp threads) and repeats the process from left to right. Here she sits for hours at a time to weave just a few inches of the fine shiny fabric that has delighted princes and been the hallmark of Mandar weavers for centuries.

ten days are required for even the most skilled weaver to complete a single silk sarong.

As tedious and difficult as weaving may seem, skill with the loom still represents for Mandar people the most delicate of all feminine arts. Moreover, since weaving is done in the home, using looms that can be rolled up and set aside when other matters beckon, it continues to be an extremely suitable economic activity for women with children and husbands to cook and care for. Indeed, women who can cook and weave with skill are still thought to make the most desirable wives.



Mandar back-tension loom (cat. no. 265700). Sketch by Elizabeth Enck.

Weaving is monotonous work but demands considerable precision, both to maintain the proper tension necessary for a consistent fabric and to ensure that the motif is reproduced again and again with the correct colors and spacing. As she works, the weaver stops periodically to moisten the warp, using a mixture of citrus oil and water, and to roll up the finished fabric onto her breast beam and unwind more warp from the warp beam. Although Mandar women weave with lightning speed and extraordinary dexterity, seven to

It is said that in the old days, the "tick-tick-tick" of a girlfriend tapping the thread into place on her loom, even if only heard from across the village, was enough to gladden any young man's heart.

In the past, virtually all Mandar women were weavers. They made cotton sarongs for their families' daily wear as well as silk sarongs for festive occasions. But by far the majority of their weaving was sold to merchants who exported them throughout the archipelago. Indeed, Mandar sarongs, together with

copra, rattan mats, and fish nets (also woven by Mandar women) provided the capital needed for inter-island trade.

For centuries, Mandar silk and cotton sarongs have played a vital role in the local economy, being sold by Mandar merchants and sailors by the hundreds of thousands to other Indonesian traders, who sold them in the *pasars*, or open air markets, in nearly every part of the country. More than a dozen Mandar sarong merchants even had agents stationed permanently in West Sumatra—where Mandar textiles were especially popular — to handle the lively and lucrative sarong trade.

to dozens of different ethnic groups in the archipelago. This active trade provided a market that could absorb every sarong that Mandar weavers might produce. Each ethnic group, however, had its own preferred designs, colors, and styles, which meant that Mandar weavers always had to weave the motifs and patterns that could satisfy their overseas consumers. Over the years, this has meant the introduction of many new motifs and a rich repertoire of designs, only a small portion of which can be thought of as traditionally Mandar.

Ironically, although Mandar people are best known in Indonesia for their high quality silk sarongs,

Author (right) at the wedding of Muh. Yamin Albar and Rahmania M. (center). Karama village, 1986.

Mandar merchants and sailors also took sarongs with them on their annual trading voyages that covered thousands of sea miles, from Singapore in the west to the Moluccas (or Spice Islands) in the east. This inter-island peddling trade brought sarongs and other Mandar products to local consumers, where they were exchanged for spices, bêche-de-mer (sea cucumber), pearls, and other local products in great demand in Singapore and overseas markets. These products, together with sarongs, were sold in Singapore to buy Chinese, Indian, and European goods.

Mandar textiles have always been closely linked to the inter-island trade of the Indies, being exported

these were formerly made in relatively small numbers. The raw silk Mandar use has always been imported from China via Singapore, Jakarta, and Ujung Pandang. During the colonial era, production of silk sarongs was small because the raw silk was difficult to obtain in large quantities and too expensive for most consumers. Within the last twenty years, silkworms have been introduced to Sulawesi, but Mandar weavers insist that the quality of local silk is inferior. Thus, the entire Mandar silk-weaving industry continues to rely entirely on an imported raw material.

The Indonesian economy has changed considerably in the 20th century, but weaving with tradi-

Women attending a noble wedding. The umbrellas in the background are emblems of royal blood. They are carried in the wedding procession to shade the wives of ruling princes (not shown). Karama village, 1986.

tional looms is still an important cottage industry that provides a small but much-needed income for about 25,000 Mandar women. Until the mid-1960s, cotton sarongs were the major product of this home-based industry. But under competition from cheaper factory-made sarongs, hand-woven cottons have all but disappeared. Local weavers, however, have rapidly adapted to this new commercial environment by increasing their production of silk sarongs to meet an ever-growing demand from all over the country. Silk weaving used to make up only a small part of the Mandar sarong industry (probably fewer than 10,000 sarongs per year); now it comprises virtually the entire production, totaling more than a quarter million sarongs each year.

Despite many changes in the lives of Mandar people, weaving continues to play an important part in Mandar society. There are, perhaps, fewer weavers than a century ago, but if you walk down the back streets and alleyways of Karama, Pambusuang, or dozens of other Mandar villages, from nearly every house you will hear the distinctive "tick-tick-tick" of women busy at their looms and you can still see young girls threading warp, much as they have done for generations. **FM**

The largest nest in Hyde Park's green ash tree is about six feet long and contains several individual nesting compartments, each occupied by a pair of monk parakeets. The nest was first built about eight years ago, but is being constantly reshaped and modified.

Hyde Park's Parakeets

These Green-Winged Arrivals from the Argentine Appear to Be Settling in

by David M. Walsten

photos by the author

Five miles south of Field Museum, in the Chicago neighborhood known as Hyde Park, stands a green ash tree which, in every respect, seems to be an average specimen of full-grown *Fraxinus pennsylvanica*—except for four conspicuous features: gigantic masses of twigs clutched in the tree's upper branches. These masses, of various shapes, are the colonial nests of the monk parakeet (*Myiopsitta monachus*), an exotic species from Argentina and other South American countries which took up residence in Hyde Park in 1980*.

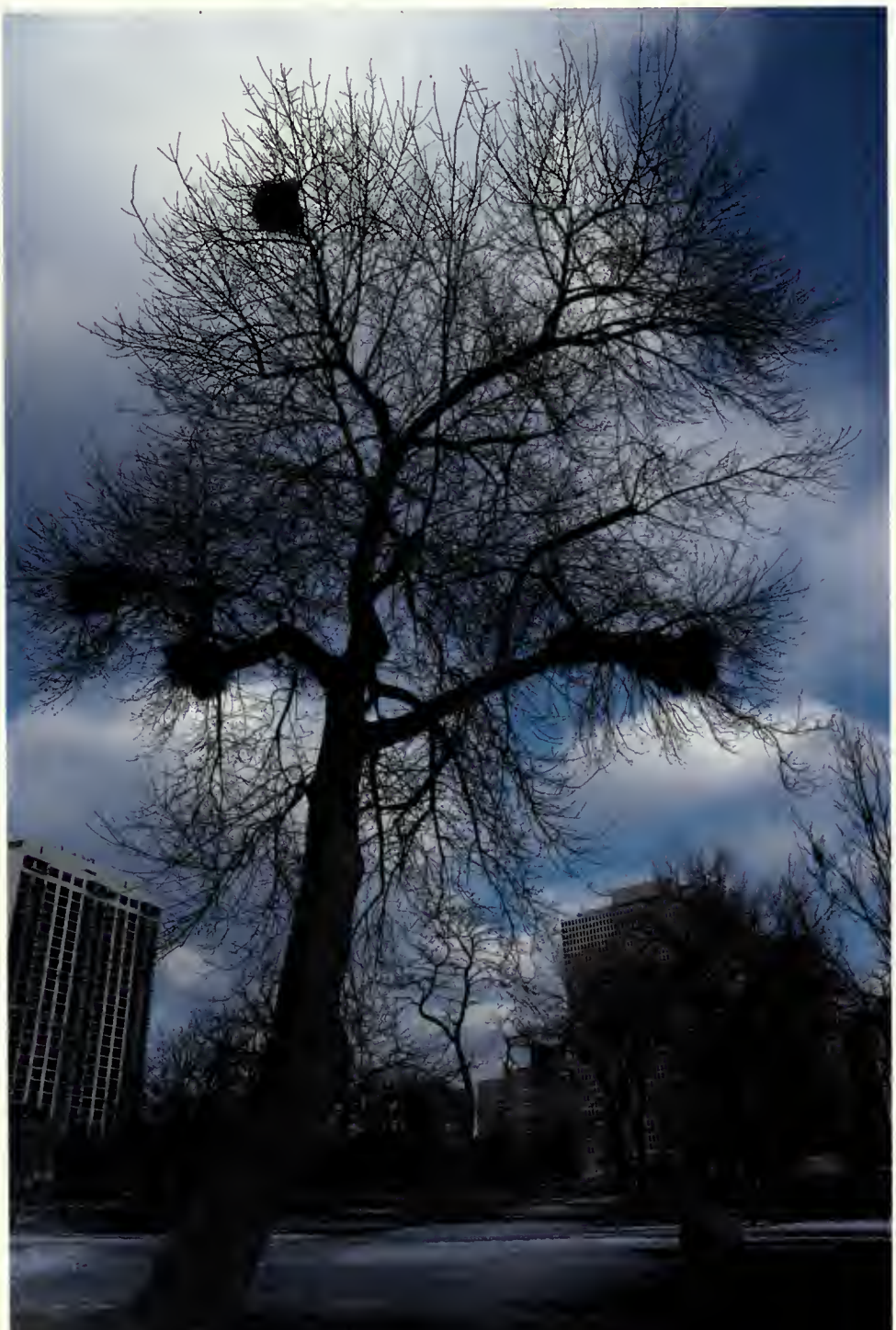
Because these brightly colored birds had already attracted considerable local attention and managed to survive the harsh Chicago winters, a feature piece on the birds was published in the May 1985 *Bulletin*. Here I will again review the status of the parakeet colony and provide an up-date:

Known in the pet trade variously as the quaker, gray-headed, or gray-breasted parakeet, the species is native to the subtropical and temperate zones of Bolivia, Uruguay, Paraguay, southern Brazil, and Argenti-

*In the early 1970s monk parakeets were reliably reported in the city's southeast suburbs.

na as far south as 40° S latitude (the Southern Hemisphere equivalent of Philadelphia, Denver, and Champagne-Urbana). In the United States it is favored as a cage bird, despite its noisy chatter, and about 10,000 are imported every year from South America to serve that market. Its occurrence in Chicago and other North American locations may be explained by the occasional release of these birds, accidental and otherwise, from homes where they have been kept as pets or while in transport.

Since first being reported in the wild in the United States more than 20 years ago, the monk parakeet has given the impression in some locales that it would settle into a permanent, breeding status, only to disappear after a season or two. In a very few other areas, it seems to be establishing itself, barring human intervention. Some observers believe it is filling that ecological void left by the closely related Carolina parakeet, which became extinct in the early years of this century and occurred solely in the United States. Another competitor for the Carolina's niche may be the evening grosbeak (*Coccothraustes vespertinus*), according to Norman L. Brunswig, Stephen G. Winton, and Paul B. Hamel in the *Wilson Bulletin*.



The green ash tree on 53rd Street, showing its four monk parakeet nests. The original, larger nest is at the right. The smaller nests are rather well concealed by foliage during the summer.

The monk parakeet is about 11½ inches long, nearly half of this being tail. The back is bright green or gray-green, the tail green and blue. The upper belly is a soft yellow, the head and breast grayish. (It is for this grayish pattern, presumably, that the sobriquet "monk" was applied.) The wings are mostly blue. The mature bird weighs about five ounces; coloration and size appear identical for both sexes.

Among all the known species in the parrot family, numbering well over 300, the monk parakeet is the only builder of such a nest: an irregular-shaped stack of twigs which may be as large as 15 to 20 cubic feet in mass and weigh several hundred pounds. In South America the birds seem to favor thorny trees (particularly the tala, *Celtis spinosa*) for the nest, but they are commonly constructed on manmade structures such as telephone or utility poles, under eaves, or on window ledges. Eight of the nests have been found in a single tree. Some huge parakeet nests in Argentina have been used by continuing communities for decades. A dozen pairs may breed in a single nest, each with its own compartment. The nest is used all year round and damaged sections are repaired at the approach of the breeding season. Other species that make this unusual type of nest are the palm chat of Haiti and Santo Domingo, the buffalo weaver of subsaharan Africa, and the sociable weaver of southwestern Africa.

The individual nesting compartment is about 18 cm (about 7 inches) in diameter and the entire tunnel 34 to 40 cm (about 14 to 16 inches) long. From five to nine glossy white eggs (relatively small for the bird's size) are customarily laid once or twice a year and hatch in 31 days.

In its native countries, the monk parakeet favors areas of low rainfall in savannah, thorn scrub, palm groves, open forest, fruit orchards, and crop lands, most commonly in lowlands, but ranging to altitudes of 3,000 feet in the foothills of the Andes. Here the temperature may drop to as low as 20°F. This is a far warmer clime than Chicago's, where the bird has survived bitterly cold spells—as low as – 27° F. in January of 1985.

The species feeds on a variety of seeds and fruits, including apples, cherries, grapes, and citrus. In South America, where it has been described by a U.S. Fish and Wildlife Service publication as "one of the worst pests of agricultural crops," the monk parakeet reportedly destroys from 2 to 45 percent of those crops within its range, notably millet, sorghum, corn, sunflower, and a variety of fruit crops. The incentive of a bounty for the birds has not succeeded in alleviating the problem.

Two of the smaller nests in the green ash tree.

The bird is gregarious as a rule, and in South America flocks of up to 50 birds have been observed. In Hyde Park a top count of 42 birds was seen at one time around a group of backyard feeders. The bird flies swiftly, with rapid wing beats, usually not far above treetop height, screeching loudly as it goes.

Having first appeared in the New York area in 1967, the monk parakeet became a not uncommon sight there within several years, and its greater New York population was then estimated at around 2,500. In the *Wilson Bulletin**, Dr. John Bull of the Depart-

*85:3 1973, p. 504

ment of Ornithology, American Museum of Natural History, wrote that "Multiple releases by design and by accident have resulted in a sizeable resident population in southeastern New York, and the adjacent portions of Connecticut and New Jersey. These releases, that is escaped birds, came from broken crates at Kennedy Airport, accidental escapes from pet shops, aviaries, and private owners, as well as intentional releases by persons tired of caring for these parrots." Bull also noted that the bird has bred in the outdoors in the London and Paris zoos and in the parks of Amsterdam (52.4° N latitude—further north than Saskatoon, Saskatchewan!)

At about the same time that the monk was trying to accommodate itself to the greater New York area, others of this species were reported to be taking up residence at various sites along the Atlantic Seaboard and as far west as Pittsburgh. In the late seventies, Federal and state officials, disturbed by the parakeet's apparent success in the Northeast and New York City, in particular, effectively eliminated them. This was accomplished in a relatively short time. If the nest of the species were not so elaborately constructed and large, it is questionable whether their elimination could have been achieved. They never have made a comeback, and at this time only a single breeding pair is known to be nesting in Brooklyn. In Florida, notably the Greater Miami area, the monk parakeet has established breeding populations which, according to Dr. Oscar Owre, professor emeritus of Ornithology at the University of Miami, have increased in the past few years. Eleven other parrot or parakeet species are also reported to be nesting in that area and six additional species have been sighted.

The real nests in the Jackson Park floodlight standard (south of the Museum of Science and Industry) are in the hollow crossbars, whose diameter size is much like that of a typical compartment in an all-stick nest. Only the birds can tell you what purpose the twig masses serve, but they may be the beginnings of an attempt to create a "conventional" nest. Another light standard, next to this one, also contains at least one nest.

A small nest, with a single compartment, in a poplar some 80 yards north of the green ash tree.

The Hyde Park colony apparently got its start with a nest on the fire escape of an apartment building two or three blocks south of the green ash tree (which is on 53rd Street near Lake Shore Drive), but the birds' noise, so close to human habitation, quickly earned them an eviction. Their next step, it appears, was to construct the nest in the green ash. On Memorial Day of 1984 the nest, already huge (*e.g.*, several cubic feet in mass), was partly destroyed by gale-force winds. Among the nest debris, shattered eggs with embryos were found by ornithologist Doug Anderson, establishing for the first time that this was a breeding population.

Skins of the monk parakeet in the Field Museum collection. These specimens were obtained in Argentina in the 1920s—long before the bird was seen in the wild in the United States. The specimen at top is about 11 inches in length. The sexes are outwardly alike.

Skins of the thick-billed parrot, *Rhyncopsitta pachyrhyncha,* in the Field Museum collection (top specimen about 15 inches long). These were collected in Mexico in 1918. Now rare, and apparently confined to the forests of the Sierra Madre, the bird formerly ranged across the Rio Grande into Arizona and New Mexico, where the last confirmed sighting occurred in 1936. Other than the Carolina parakeet (now extinct), it is the only member of the parrot family known to have occurred in the United States naturally.

This nest, about the size of a beach ball, is high up in a Carolina poplar on Jackson Park's Wooded Island. It probably contains only one nesting compartment, though flocks of a dozen birds often congregate about it.

During that same period, another nest was being constructed behind the smokestack of another apartment building several blocks to the south — a nest which remains in use in 1988. By the summer of 1987, the single large nest in the green ash tree (about six feet long, constructed largely along a single bough) had been joined by six or seven others in the same tree. After the autumn leaves were shed, however, only four nests remained. Other nests have appeared from time to time in the neighborhood: in a Carolina poplar on Jackson Park's Wooded Island, on floodlight standards by the Jackson Park golf driving range, in a poplar some 80 yards north of the green ash, under the air-conditioner of an apartment on 55th Street. Some of these, however, do not seem to have been used on a regular basis during the winter of 1987-88, and others are only partially complete—seemingly abandoned in mid-construction—and now await destruction by the wind. Other small nests have come and gone over the past several years—apparent victims of the same natural destructive forces.

While the Hyde Park parakeet population has steadily increased in size, the birds do not seem to be any more widespread in the greater Chicago area as a whole than three years ago. One nest is reported in the city's far northwest side, another near Montrose Beach, in the north. An active nest with breeding birds in DuPage County has been under scrutiny by a professional biologist. Almost certainly there are other nests, but it is equally certain that these are few and far between.

The survival of the monk parakeet through winters of a severity unknown in its native South American homeland has been attributed by specialists to a ready food supply at private feeders. Without these, it has been conjectured, the birds couldn't make it. In this regard, it may be significant that most, if not all, monk parakeet populations reported in the northern states have been in urban or suburban areas, where such feeding stations are never far distant.

The success of the Hyde Park parakeet colony may prove to be its own undoing. The Animal Damage Control office (USDA), in Springfield Illinois, has been tracking the colony's progress and, according to the control program director for the Illinois area, Ronald D. Ogden, a cooperative move with Illinois state agencies to eliminate the birds may be in the offing. The monk parakeet, he suggests, may pose an even more serious threat to the environment than has been realized by the European starling (introduced to the United States in 1890 and now found throughout the country).

Field Museum ornithologists are also concerned about the monk's potential threat, having seen firsthand the bird's depredations in South America. Others take a more moderate view. Chicago Academy of Sciences ornithologist Mark Spreyer, an occasional lecturer on midwestern birds at Field Museum, thinks it most unlikely that the monk parakeet could become a pest here, basing his view on the monk's breeding biology, on fundamental differences between its native environment and that of the Midwest, and other considerations. He also points out that caution should be used in comparing the parakeet with the starling, which is singularly well adapted to succeed in a wide variety of habitats.

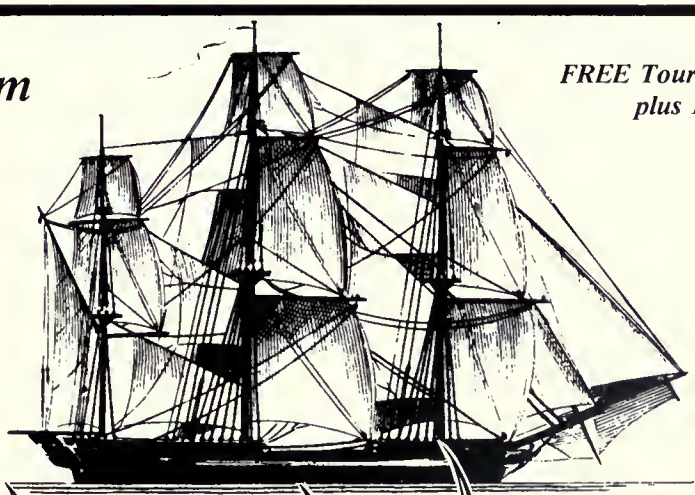
There is uniform agreement among biologists and environmentalists, however, that any recently introduced exotic species must be carefully monitored. "No one," says Dr. Herbert W. Levi of Harvard's Museum of Comparative Zoology, "can introduce exotic animals and forecast their biological effect. These introductions can never be made on a scientific plane." We have seen too many accidental or innocent introductions of exotic species explode into costly environmental problems. If the monk parakeet were to gain a foothold in New York's vineyard areas, suggests the American Museum's Dr. Bull, the consequences might be catastrophic to that state's grape-growing industry.

The Carolina parakeet, which became extinct in the early 1900s. Some believe that the monk parakeet is filling the Carolina's ecological niche.

But we have also seen instances of deliberate introductions that failed. Several attempts to introduce Europe's giant grouse, the capercaillie, met with failure, including the release of 471 birds in Michigan, the Adirondacks, and British Columbia. The introduction of 1,400 Indian sand grouse also was a complete failure. Why these introductions failed is not completely understood, demonstrating once again the complexity of environmental controls.

Finally, we are left with many unanswered questions. How much do we know about the diseases and parasites that monk parakeets are particularly vulnerable to? Which avian competitors are most threatening to them? How effective are predators in reducing their numbers? What other environmental influences may affect their success? How much have we taken the trouble to learn, in scientifically controlled circumstances, about the dietary proclivities of this bird? What investigative programs have been put forth by Federal or state agencies to determine the monk's potential as a threat in this northern environment? **FM**

Field Museum Members are cordially invited . . .



FREE Tour Book with admission, plus 10% off all Milwaukee Museum Gift Shop purchases over $5, when you present Field Museum Membership Card.

Feb. 6 – April 24

Local exhibition sponsored by Friends of the Museum, Inc.

MAGNIFICENT VOYAGERS

U.S. Exploring Expedition
1838 – 1842

In 1838 six ships set out to explore the high seas. The treasures brought back by sailors and scientists from their voyage amazed the world. Don't miss this spectacular Smithsonian exhibit.

Milwaukee Public Museum
Downtown, 8th & Wells
Open daily 9 – 5
(414) 278-2702

FIELD MUSEUM TOURS

Dear Field Museum Member:

Whale-watching and observing the varied bird life along the St. Lawrence are just some of the pleasures that await members of our July tour to Canada's Maritime Provinces. These rare experiences will be particularly worthwhile since your group will be accompanied by Dr. David Willard, manager of Field Museum's bird collection and a seasoned tour leader. He most recently led a tour to Alaska.

Our special voyage aboard the magnificent M.V. *Illiria* highlights the incredible natural history and untouched beauty of the Maritime Provinces. In addition to Dr. Willard, a marine biologist on board will discuss the region's remarkable wildlife, while an expert on the history and diversity of our ports-of-call will prepare us for on-shore excursions.

This tour promises to be one of our finest ever, and the fact that we will be cruising on the elegant *Illiria* ensures that this will be a memorable voyage. With its ratio of 90 crew members serving only 135 passengers, the *Illiria* guarantees a high level of personalized service at all times. The superbly furnished ship has gleaming brightwork, broad teakwood decks, a large dining room that accommodates all passengers at a single sitting, and museum-quality artwork. The unique nature of this program, which combines the pleasures of the great outdoors with the luxury and convenience of cruise travel, makes for an ideal summer family vacation. With all sightseeing tours included in the rates and all meals included during the cruise, this program presents an excellent travel value. And, our special "third person sharing rates" enable three or four persons to occupy a single cabin at significant savings—a wonderful opportunity for inviting your children or grandchildren.

Most of all, this tour will afford you the opportunity to view the area's great variety of bird life with the guidance and expertise of a Field Museum specialist.

We have indications that this program will sell out quickly. To avoid disappointment, we encourage you to book your reservation soon.

Sincerely,

Willard L. Boyd
President

M.V. *Illiria*

Voyage to The Gulf of St. Lawrence and Canada's Maritime Provinces

Aboard the *Illiria*
July 1-9, 1988
Accompanied by Dr. David Willard, Field Museum Zoologist

ITINERARY

July 1
Fly to Montreal. Transfer to Delta Montreal Hotel.

July 2
Morning drive to Quebec City; sightsee in the afternoon. *Illiria* sails at 4:00 pm. Evening cruise along the St. Lawrence River shore. Captain's welcome dinner.

July 3
Cruise St. Lawrence River this morning. Whale-watching by Mingan Islands this afternoon. Evening cruise to Newfoundland. Gros Morne National Park.

July 4
Morning arrival at Gros Morne National Park for day of shore excursions. Evening cruise past Bay of Islands and along Newfoundland's south shore.

July 5
Morning arrival at St. Pierre Miquelon for shore excursions. Evening cruise past Grand Miquelon to Magdalen Islands.

July 6
Morning arrival at Magdalen Islands. Afternoon shore excursions. Evening cruise to Gaspé Peninsula.

July 7
Morning visit to Bonaventure Island Bird Sanctuary. Afternoon visit to Percé at tip of the peninsula. Evening cruise up St. Lawrence River shore.

July 8
Whale-watching this morning. Cruise Saguenay River Fjord in the afternoon. Evening cruise to Montreal. Captain's farewell dinner.

July 9
Disembark Montreal after breakfast. Transfer to airport for flight home.

Rates: $2,090-$2,450 per person (double occupancy); third person $430-$550. These rates do not include air fare, but do include a $200 tax-deductible contribution to the Field Museum. Estimated round trip air fare between Chicago and Montreal: $195. To reserve tour space, send $200.00 per person deposit to Field Museum Tours. A brochure will be mailed upon request. Please phone 322-8862 for further information.

For reservations, call or write Dorothy Roder (322-8862), Tours Manager, Field Museum, Roosevelt Rd. at Lake Shore Dr., Chicago, Il 60605

Field Museum of Natural History
Membership Department
Roosevelt Road at Lake Shore Drive
Chicago, IL 60605-2499

MISS MARITA MAXEY
7411 NORTH GREENVIEW
CHICAGO IL 60626

FIELD MUSEUM OF NATURAL HISTORY BULLETIN

May 1988

Members' Night Friday, May 6

¡Celebracion! see p. 3

Field Museum of Natural History Bulletin

Published since 1930 by
Field Museum of Natural History
Founded 1893

Editor/Designer: David M. Walsten
Production Liaison: Pamela Stearns
Staff Photographer: Ron Testa

BOARD OF TRUSTEES

Robert A. Pritzker
Chairman
Mrs. T. Stanton Armour
George R. Baker
Robert O. Bass
Gordon Bent
Mrs. Philip D. Block III
Willard L. Boyd,
President
Robert D. Cadieux
Worley H. Clark
James W. Compton
Frank W. Considine
William R. Dickinson, Jr.
Thomas E. Donnelley II
Thomas J. Eyerman
Marshall Field
Ronald J. Gidwitz
Clarence E. Johnson
Richard M. Jones
John James Kinsella
Robert D. Kolar
Hugo J. Melvoin
Leo F. Mullin
James J. O'Connor
James H. Ransom
John S. Runnells
Patrick G. Ryan
William L. Searle
Mrs. Malcolm N. Smith
Robert H. Strotz
Mrs. Theodore D. Tieken
E. Leland Webber
Blaine J. Yarrington

LIFE TRUSTEES

Harry O. Bercher
Bowen Blair
Stanton R. Cook
Mrs. Edwin J. DeCosta
Mrs. David W. Grainger
Clifford C. Gregg
Mrs. Robert S. Hartman
Edward Byron Smith
John W. Sullivan
J. Howard Wood

CONTENTS

May 1988
Volume 59, Number 5

MAY EVENTS AT FIELD MUSEUM 3

TEACH THE MIND, TOUCH THE SPIRIT
by Carolyn Blackmon,
Chairman, Department of Education. 6

HOATZINS AT HOME
by William Beebe 15

COSTA RICA, TROPICAL BIOLOGY, AND A VISIT WITH OTÓN JIMÉNEZ
by William C. Burger, Curator of Vascular Plants. 20

FROM BUSHMAN TO TUT —EXHIBIT BLOCKBUSTERS OF THE PAST
by Alan Solem, Curator of Invertebrates,
and W. Peyton Fawcett, Librarian 25

FIELD MUSEUM TOURS
Featuring a trip to Boston and a special viewing of "Ramesses the Great" exhibit at the Boston Museum of Science 30

COVER
A walk through wonderful Warren Woods in May. Warren Woods, Michigan, is about an hour's drive east of Chicago. Photo by Chicago nature photographer Laszlo Nagy.

Volunteer at Field Museum

Field Museum currently has a wide variety of projects and programs for weekday and weekend volunteers. During the week, volunteers can work either with the public or behind-the-scenes in the scientific and administrative areas. On weekends, volunteers staff our participatory exhibits or Webber Resource Center, or lead hall programs for the visitors. For more information, please contact the Volunteer Coordinator at (312) 922-9410, extension 360.

Field Museum of Natural History Bulletin (USPS 898-940) is published monthly, except combined July/August issue, by Field Museum of Natural History, Roosevelt Road at Lake Shore Drive, Chicago, IL 60605-2496.

Copyright ©1988 Field Museum of Natural History.

Subscriptions: $6.00 annually. $3.00 for schools. Museum membership includes *Bulletin* subscription. Opinions expressed by authors are their own and do not necessarily reflect the policy of Field Museum. Unsolicited manuscripts are welcome. Museum phone: (312) 922-9410. Notification of address change should include address label and be sent to Membership Department. Postmaster: Please send form 3579 to Field Museum of Natural History, Roosevelt Road at Lake Shore Drive, Chicago, IL 60605-2496. ISSN: 0015-0703.

EVENTS

Raices del Ande

¡Celebración!

Weekends in May
Join us for weekends in May in a celebration of Latin American cultures—with music, dance, art demonstrations, stories, and poetry.

Saturday and Sunday, May 7 and 8

1:00-3:00pm **Mexican Murals**
Join artist and muralist José Guerrero as he demonstrates this vital and vibrant art form.

1:00-3:00pm **How the Birds Changed Their Feathers**
Listen to this delightful South American tale that explains why birds are different colors, then look at some adaptations and habits of South American birds.

2:00pm **Raices del Ande**
The magical sounds of Andean music derive from the mingling of the ancient Incan and Spanish cultures. Raices del Ande express, through music, the spirit of people united by common roots, geography, and a shared history. Enjoy this lively performance of original and traditional South American folk music.

Saturday and Sunday, May 14 and 15

1:00-3:00pm **Woodcuts**
Carving into wood produces pattern as well as shape. René Arceo's woodcut prints range from abstract lines to expressive portraits.

1:00-3:00pm **Sculpture in Clay**
Push the clay here, carve it there. Help sculptor Roman Villareal create a new work in clay.

2:00pm **David Hernandez and Street Sounds**
The cunning urban poetry of David Hernandez is colored by the Latin American jazz of Street Sounds. David, Chicago's unofficial poet laureate, has an expressive voice, a quiet sense

Continued ▷

EVENTS

of showmanship, a sharp ear, and rare bits of bluster that are attuned to the urban rhythms of daily life. His poetry is about always hearing the cadence and cacophony of the street life symphony.

Saturday and Sunday, May 21 and 22

1:00-3:00pm **Tiny Dancers**
Help Michael Montenegro of Zapato Puppet Theatre carve and sculpt marionettes, rod, and hand puppets.

1:00-3:00pm **¡Olé!-¡Olé!**
Join in the fun of bolero (a cup and ball game), or spin a Mexican trompo (top), canquas (marbles), or lotteria (bingo).

2:00pm **Los Pleneros de Yucayeque**
Enjoy a lively and exciting program of Puerto Rican folk music.

Saturday and Sunday, May 28 and 29

2:00pm **Brechita**
Carmen Aguilár guides Brechita, a young people's theatre group, in a series of Latin American myths and legends.

World Music Program

Weekends in May
1:00pm and 3:00pm

April 30 and May1

1:00pm **Eli Hoenai**—African percussion.
3:00pm **Librado Salazar**—Classical guitar.

May 7 and May 8

1:00pm **Chinese Music Society of North America**—Classical instruments of the Chinese orchestra.

3:00pm **Ari Brown**—Saxophone.

May 14 and 15

1:00pm **Chinese Music Society of North America**—Classical instruments of the Chinese orchestra.

3:00pm **Alas Poets**—Urban poetry.

"Tundra Watch," oil painting of snowy owl by Rod Frederick. On view in "Birds in Art" in Gallery 9.

EVENTS

World Music Program

May 21 and 22

1:00pm **Jamila-Ra**—Poetry.

3:00pm **Margarita Lopez-Castro**—Poetry.

May 28 and 29

1:00pm **Librado Salazar**—Classical guitar.

3:00pm **Alas Poets**—Urban poetry.

The World Music Program is supported by the Kenneth and Harle Montgomery Fund and a City Arts III/IV grant from the Chicago Office of Fine Arts, Department of Cultural Affairs.

Spring at the Field

Hall Interpretive Program
Thursdays through Sundays in May

HALL INTERPRETERS, located throughout the exhibit halls, help young and old experience the wonders of Field Museum. Discover the formation and uses of gemstones, play a Native American ring and pin game, explore the many dinosaur extinction theories, learn the ancient Egyptian way of making paper, and more.

Take a sensory journey to discover a variety of fragrant plants, explore the many sizes, shapes, and uses of teeth; learn the diet of owls through the dissection of their pellets; and learn Maori myths, crafts, and games. These exciting activities are available to all Museum visitors Thursday through Sunday. Please consult the television monitors throughout the Museum for activity locations.

The Hall Interpretive Program is supported by grants from the Joyce Foundation and the Lloyd A. Fry Foundation.

Weekend Programs in May

EACH SATURDAY AND SUNDAY you are invited to explore the world of natural history at Field Museum. Free tours, demonstrations, and films related to ongoing exhibits at the Museum are designed for families and adults. Listed below are some of the numerous activities each weekend. Check the activity listing upon arrival for the complete schedule and program locations. The programs are partially supported by a grant from the Illinois Art Council.

May 14, 11:00 am **American Indian Stories**
Myths, legends, and daily life of American Indian cultures.

11:30 am **China's Dragon Tales**
The evolution of theatre from early Han to the cultural revolution.

May 21, 11:00 am **Ancient Egypt**
The traditions of ancient Egypt, from everyday life to myths and mummies.

May 28, 11:00 am **American Indian Stories**
Myths, legends, and daily life of American Indian cultures.

11:30 am **Tibet Today and Tour of Collection**
See Lhasa and other towns now open to tourists, then take a tour of our Tibetan exhibit (slide lecture and tour).

These programs are free with Museum admission and tickets are not required.

Teach the Mind Touch the Spirit

The Museum's Mission of Exploration and Discovery

A presentation to the Women's Board of Field Museum March 9, 1988

by Carolyn Blackmon
Chairman of the Department of Education

I am pleased to have this opportunity to share some ideas with you about museum education. As I prepared this paper to present to our Women's Board, it gave me a chance to reflect on and think about several issues—to look at the present from the past and the past from the present. Join me in this reflection.

You are a fourth grade teacher with 41 kids and the 4 required parent or neighborhood chaperones coming to Field Museum from Chicago's near west side. You have been on a bus for one hour. It is the first time that your children have ever left their neighborhood surroundings, so this adventure is exciting and maybe a bit scary. They are so excited to be going someplace that they may not "see" anything in the visual sense. But, what they will see in their hearts is an "experience" and that something, that object or person will give them a new vision beyond the small world that they live in, a horizon for exploration and discovery.

A teacher expresses it best: "It's very hard to teach language arts when the kids' lives are so limited and their experiences so dreary; most of them have never been in a big yellow bus or even seen Lake Michigan. When we come to the Museum a whole new window to the world opens up for them." Or the Chicago Board of Education Social Studies Bureau Director who remarked, "museums bring our books to life, they don't supplement school curricula, they augment it. Museums can offer the concrete rather than the abstract level of learning." This understanding of the educational strengths of the Museum on the part of teachers and administrators has taken years of concentrated effort to develop.

Taking a step back in time, Field Museum rose from the international collections and the peoples who came together to share in a cultural, artistic, and technological extravaganza. Chicago in 1893 was the Calgary of America. After a successful competition with New York to be the site for the World's Columbian Exposition, we accomplished the unexpected. Chicago created a venue for the vast range of every art form, from sculpture to music and dance; replications of village life and dramatic performances with all the accoutrements from the far corners of the world; the Congress of Ideas as the forum for special interest group conferences and conventions. It was all here, even Mr. Ferris's famous wheel.

Something else, however, was significant to the organization of this event: the efforts of leading women in the Chicago community. For example, Mrs. Potter Palmer convinced the fair commission to institute the Board of Lady Managers which, in turn, developed the Women's Building. Thirteen women architects competed and 23-year-old Ms. Hayden at MIT won the competition. Bertha Palmer was convinced that the fair was so large that a special building for children needed to be built. When the fair commission declined support for it, she raised funds from every state to build the Children's Building so that visitors to the fair would have a special educational place for their children to go and enjoy the day. Twenty-seven million people came to Chicago's fair of fairs that summer; this world of wonders gave birth to exceptional support from Chicago's leaders during a very arduous time in the cities' and nations' economic crisis.

The Columbian Museum was installed in the Palace of Fine Arts, the white knight of the Midway. It was not too weather-resistant, I am told. In fact, the curators worked with their feet in baskets of straw to keep warm in the winter! And most important for us, a new museum was born — the Field Columbian Museum, now our own Field Museum of Natural History.

The Children's Building, World's Columbian Exposition

The result of this original effort and nearly a century of continuing community support is a major museum that shares its prestige with only three others, the British Museum of Natural History, the Smithsonian, and the American Museum of Natural History in New York. Field Museum has become an international center for learning and an institution of service to the scholarly and public communities.

The true grit, in a sense, and determination of Chicago's community leaders to ensure equal education in the natural and human sciences for Chicago's schoolchildren is exemplified by their generous support in planning time and dollars. For example, significant endowments from the Norman Wait Harris and Anna Louise Raymond Foundations were some of the seeds that helped to establish the Department of Education that we know today. The Harris Extension Loan program, initiated in 1911, produced miniature dioramas for teachers and their students that are on a par with the Thorne rooms at the Art Institute of Chicago. These slices of natural habitats were first exhibited at the Sesqui-Centennial International Exposition, Philadelphia, 1926. Today more than 1,000 miniature dioramas and 750 additional free-standing materials are available for free loan to teachers and community leaders in Chicago's metropolitan area. New topics and related materials, based on the Museum's strengths, are in various stages of development. Harris Extension became the first museum outreach program in Chicago and continues to be an important resource for community group leaders to use in their on-site programs. Anna Raymond's endowment in 1925 was to establish a school group lecture program in the Museum to be presented by museum teachers in order to free the curator-scientists to attend to their taxonomic duties among the collections. Up to this time the curators had

been responsible for school tours. In 1921, Edward E. Ayer endowed free public programming by establishing the public lecture fund. This series continues today.

These Chicago pioneers, the creators of the industrial revolution, the risk-takers who were doing business west of the Hudson River in the earliest part of the 20th century, directed the Field Museum and provided million-dollar endowments to enrich the world of the child and the public at large with an understanding of and appreciation for the collections of objects and their role in both natural and human contexts. This humanness continues to drive the Museum's educational endeavors.

In 1943, at Field Museum's fiftieth anniversary, Robert Maynard Hutchins, then president of the University of Chicago, stated in his address: "As an educational institution, Field Museum possesses certain special advantages. It has no football team. It gives no course credits or course examinations and awards no degrees. The students of the Museum come here to learn. They do not ask it to help them make friends, get a better job or give them a leg up the social ladder. Formal education, moreover in schools, colleges and universities is something you finish. It is like the mumps, measles, or chickenpox. Having had education once, you need not, indeed you cannot have it again. You put it behind you with your other juvenile troubles, praise the Lord that it is over at last, and proceed to the really important tasks of life. The Museum is free from this regrettable tradition. It operates on a cradle-to-the-grave principle."

He quoted Director Clifford C. Gregg, who had stated in 1939 "Whether its collections are used for the study of industrial scientists who seek to make a profit, by scholars who seek to solve some problem of research, or by casual visitors who seek recreation and enjoyment is not of primary concern to a museum. The only real concern is that the collections be available and that they be used." It has become a professional practice that collections be continually reinterpreted as new information emerges.

Hutchins continued, "The pedagogical significance of the collections is as obvious as it is great. The chief difficulty of any classroom teaching is the absence of three-dimensional reality. It may shortly be as hard to make an American city-dweller understand agriculture and its significance as it would be to discuss the Fiji Islanders with the Eskimos."

Hutchins's speech was powerful and insightful. He called for museum-school collaboration from

The Women's Building, World's Columbian Exposition

elementary to higher education, museum understanding of the impacts of increased leisure time, the museum's responsibilities, and the opportunities for adult education. He concluded that the museum must change from a curio cabinet into an integrated part of an educational system dedicated to teaching people how to live human lives, and how to live them together on a worldwide basis. Hutchins understood well the power of the "reality" and "meaning" of real objects; he also understood the portents of a technological future and sociological change.

We have taken a quick look at the beginning of Chicago's philanthropy, the high regard for museum learning, high hopes, and diligent efforts in collaboration. Running parallel to this strong community support were developments in American society at large. Let's take a quick look down the road that we've travelled and see some of the impacts on museums:

☐ 1930-40: Economic depression; WPA support for museum artists and preparators provides necessary manpower; television was in its infancy . . . a minivision at the Century of Progress, Chicago; radio came into its own; world news was introduced at the movies; Movietone News "The Eyes and Ears of the World" was followed by the roar of MGM's lion, and *Gone With the Wind.*

☐ 1940s: The War Years. . . at home, museums were in flux—curators were conscripted and served in remote areas of the world; volunteers with special talents kept many kinds of programs functioning; Ellen Thorne Smith became the surrogate curator of Field Museum's Bird Division in Zoology.

☐ 1950-60: Post War—Pre–War: museums institute admission charges; schools are high users; black and white television is widely available; the Mickey Mouse Club stars Annette Funicello and Disneyland is born; there is world foment and an era of frantic comic relief . . . and new game shows; Neil Armstrong walks on the moon.

☐ The 1970s: Desegregation-integration; Head start pre-school programs enter the picture; color television is a hit, screens get bigger and media marketing explodes; game shows grow in popularity; museums falter and struggle with flat interest rates on endowment; museums begin to look at programming and other opportunities for support; the National Endowments for the Arts and the Humanities are born; museums begin to pay attention to who comes and why; . . . and then came the so-called blockbusters with the boy King Tut leading the way. Have we been fearful of the competition and seduced by the objects of our affection, and if so, wherefore have they taken us?

They have taken us to understand the true implications of interpretation and the ethics involved in the unique charge of the Museum's mission. We understand better that a single vase on a shelf in an exhibit without a label speaks volumes to our visitors about the attitude of the Museum towards its visitors, and its role in interpretation. Bertha Palmer knew what it was about when she included storytellers and lectures and entertainment and play space in her Children's Building in 1893. The audience has become a major focus of thinking about museum education. As museums attempt to serve a growing, more diverse public, they are considering more carefully what their visitors want from them.

At the same time, museums have become more sensitive to what shapes the way people experience the world from their personal histories to the nature of the society they inhabit. The emergence of new kinds of family units, and the ever-accelerating pace of modern life are among the societal conditions that influence people's perceptions and thinking. We understand that perception involves personal decision from a point of view or base of knowledge. The visitor asks: Why didn't the Indians have any dishes that weren't glued together? Why did people trade shells and beads when they could have gone to the currency exchange? Why do those big bears lay such tiny eggs? Field Museum is among many museums that have responded by developing exhibits and programs that better accommodate "where people are."

We feel that education might better be described as "visitor experience." The 1984 report *Museums for a New Century* introduced a change in the museum vernacular by referring to *learning* rather than *education and instruction.* Studies have shown repeatedly that people do not learn in museums in the same pseudo-quantifiable way that they learn in other more structured education environments. While lectures or school tours do aim to pass on specific information, the typical unstructured museum visit achieves something quite different. It has been variously described as a sense of wonder, the *flow experience,* the *Ooh! Ah! experience,* and landmark learning. Reaching this personal level of experience is Field Museum's ultimate goal.

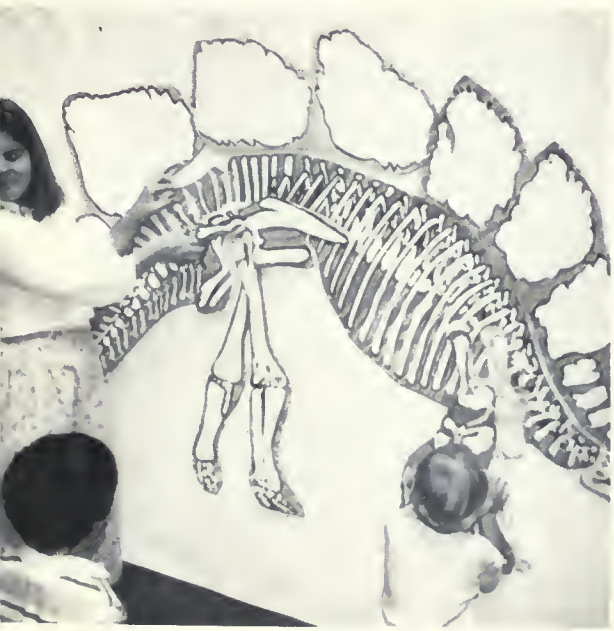
With this in mind, let's look at who we are in education and what we do, who we serve and what constitutes our short- and long-term goals: Field Museum has taken a leadership role in informal educa-

tion through collaboration with institutions of elementary, secondary, and higher education and through our energetic efforts to provide innovative and personalized interpretation of concepts, at varying levels of audience understanding through various media. To meet the Museum's mission "to enhance in individuals the knowledge of and delight in natural history," our charge is to provide experiences for our visitors which include information to enhance personal attitudes and abilities. To influence attitudes we must generate interests which may lead to involvement with exhibits and other museum resources and create situations that spark curiosity and motivate the visitor to continue exploration and discovery. To enhance the visitors' abilities we must develop their competence to use the Museum and its resources independently; to develop their ability to differentiate between objects; describe objects accurately; recognize concepts inherent in an object's characteristics; to arrive at conclusions indirectly through study and thought about objects and information; and to use visual thinking or simply to develop and fine-tune their observational skills.

Comfort and familiarity with a place and its contents encourages enjoyment and delight which, in turn, may encourage learning and that return visit. We must make the visitors first encounter with us a successful venture. What are these encounters or programs that lead to involvement? Let's look at a few:

Dino Days... a family event over a month of weekends

Protoceratops in living color



A new way to play pin the tail on!

Will they ever forget this moment?

Do it yourself dinos... what did they look like?... putting on the flesh...

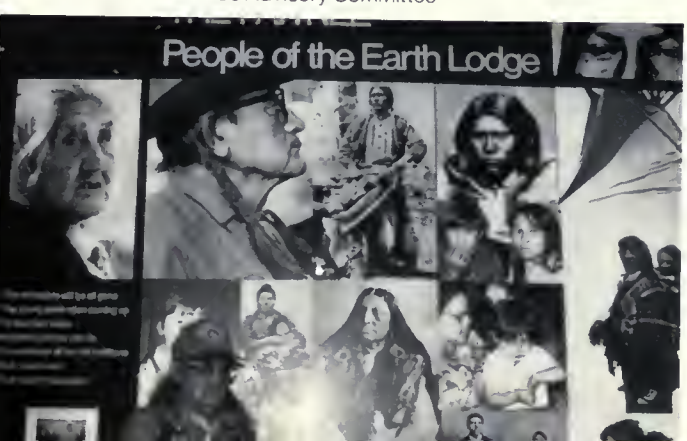
Well, it's sort of like this...

Finding out what makes up our land... 2,000 kids in 107 workshops

Phil Mathews standing below his picture... A member of the Museum's Pawnee Advisory Committee

Pawnee 10th anniversary—106,000 in 1987

How many ways can you use a buffalo?



Mary Louise and her great aunt, Mrs. May Wabaunsee, Pawnee

Over 1,200 adults explore the world in adult courses

On ecological field trips

African Heritage Week for schools in February

2,300 went to local ecological niches during the spring/fall

Musa Mosely carves a log drum

Everyone learns to play

Dance

Try a balaphon, an African Gourd marimba

Dance

Shakere, a beaded gourd that swishes

Dance

Celebrate

Create

Enjoy... and over 630,000 visitors participated in a program during 1987.

I conclude with a favorite quote: "The Museum is seductive, it woos me the learner with artful wiles, it continues to deceive me into educating myself as long as I live." Dear Mr. Hutchins: I couldn't agree with you more and thanks for your help.

And to our most important Board of Lady Managers, the Women's Board, thanks so much for your involvement and support. **FM**

HOATZINS AT HOME

by William Beebe

THE FLIGHT OF THE HOATZIN resembles that of an over-fed hen. The hoatzin's voice is no more melodious than the cry of a peacock, and less sonorous than an alligator's roar. The bird's grace is batrachian rather than avian, while the odor of its body resembles that of no bird untouched by dissolution. Still, zoölogically considered, the hoatzin is probably the most remarkable and interesting bird living on the earth today.

It has successfully defied time and space. For it, the dial of the ages has moved more slowly than for the rest of organic life, and although living and breathing with us today, yet its world is an affair of two dimensions — a line of thorny saplings threaded along the muddy banks of a few tropical waters.

A bird in a cage cannot escape, and may be found month after month wherever the cage is placed. A stuffed bird in a case may resist disintegration for a century. But when we go to look for the bluebirds which nest in the orchard, they may have flown a half mile away in their search for food. The plover which scurries before us today on the beach may tonight be far away on the first lap of his seven thousand mile flight to the southward.

The hoatzin's status lies rather with the caged bird. In November in New York City an Englishman from British Guiana said to me, "Go to the Berbice River, and at the north end of the town of New Amsterdam, in front of Mr. Beckett's house, you will find hoatzins." Six months later as I drove along a tropical river road I saw three hoatzins perched on a low thorn bush at the river's edge in front of a house. And the river was the Berbice, and the house that of Mr. Beckett.

Thus are the hoatzins independent of space, as all other flying birds know it, and in their classic reptilian affinities, — voice, actions, arms, fingers, habits, — they bring close the dim epochs of past time, and renew for our inspection the youth of bird-life on the earth. It is discouraging ever to attempt to translate habits fraught with so profound a significance into words, or to make them realistic even with the aid of photographs.

We took a boat opposite Mr. Beckett's house, and paddled slowly with nearly-flood tide up the Berbice River. It was two o'clock, the hottest time of the day. For three miles we drifted past the chosen haunts of the hoatzins. All were perched in the shade, quiet in the intense heat, squatting prostrate or sleepily preening their plumage. Now and then we saw a bird on her nest, always over the water. If she was sitting on eggs she sat close. If young birds were in the nest she half-crouched, or perched on the rim, so that her body cast a shadow over the young.

The vegetation was not varied. Muckamucka was here and there in the foreground, with an almost solid line of bunduri pimpler or thorn tree. This was the real home of the birds, and this plant forms the background whenever the hoatzin comes to mind. It is a growth which loves the water, and crowds down so that the rising of the tide, whether fresh or brackish, covers the mud in which it stands, so that it appears to be quite as aquatic as the mangrove which, here and there, creeps out alongside it.

The pimpler bears thorns of the first magnitude, often double, recurved and at such diabolically unexpected places, that like barbed wire, it is impossible to grasp anywhere without drawing blood. Such a chevaux-de-frise would defend a trench against the most courageous regiment. The stems were light gray, greening toward the younger shoots, and the foliage was pleasantly divided into double lines of locust-like leaflets.

The plants were in full flower, — dainty, upright panicles of wisteria-like pea-blooms, pale violet and white with tiny buds of magenta. A faint, subdued perfume drifted from them through the tangle of branches. The fruit was ripening on many plants, in clusters of green, semi-circular, flat, kidney pods. The low branches stretched gracefully waterwards in long sweeping

---

"Hoatzins at Home" is from *Jungle Peace*, by William Beebe, former curator of birds, New York Zoological Park, and former director of Tropical Research Station, in British Guiana, where Beebe observed the hoatzin. *Jungle Peace* was first published in 1918 by Henry Holt and Co.

curves. On these at a fork or at the crossing of two distinct branches, the hoatzins placed their nests, and with the soft-tissued leaflets they packed their capacious crops and fed their young.

Besides these two plants, which alone may be considered as forming the principal environment, two blooms were conspicuous at this season; a deep-calyxed, round blossom of rich yellow,—an hibiscus, which the Indians called makoe, and from the bark of which they made most excellent rope. The other flower was a vine which crept commonly up over the pimpler trees, regardless of water and thorns, and hung out twin blossoms in profusion, pink and pinkish-white, trumpet-shaped, with flaring lips.

The mid-day life about this haunt of hoatzins was full of interest. Tody-flycatchers of two species, yellow-breasted and streaked, were the commonest birds, and their little homes, like bits of tide-hung drift, swayed from the tips of the pimpler branches. They dashed to and fro regardless of the heat, and whenever we stopped they came within a foot or two, curiously watching our every motion. Kiskadees hopped along the water's edge in the shade, snatching insects and occasionally splashing into the water after small fish. Awkward Guinea green herons, not long out of the nest, crept like shadow silhouettes of birds close to the dark water. High overhead, like flecks of jet against the blue sky, the vultures soared. Green dragonflies whirled here and there, and great blue-black bees fumbled in and out of the hibiscus, yellowed with pollen and too busy to stop a second in their day-long labor.

This little area held very strange creatures as well, some of which we saw even in our few hours' search. Four-eyed fish skittered over the water, pale as the ghosts of fish, and when quiet, showing only as a pair of bubbly eyes. Still more weird hairy caterpillars wriggled their way through the muddy, brackish current—aquatic larvae of a small moth which I had not seen since I found them in the trenches of Pará.

The only sound at this time of day was a drowsy but penetrating *tr-r-r-r-r-p!* made by a green-bodied, green-legged grasshopper of good size, whose joy in life seemed to be to lie lengthwise upon a pimpler branch, and skreek violently at frequent intervals, giving his wings a frantic flutter at each utterance, and slowly encircling the stem.

In such environment the hoatzin lives and thrives, and, thanks to its strong body odor, has existed from time immemorial in the face of terrific handicaps. The odor is a strong musky one, not particularly disagreeable. I searched my memory at every whiff for something of which it vividly reminded me, and at last the recollection came to me—the smell, delectable and fearfully exciting in former years—of elephants at a circus, and not altogether elephants either, but a compound of one-sixth sawdust, another part peanuts, another of strange animals and three-sixths swaying elephant. That, to my mind, exactly describes the odor of hoatzins as I sensed it among these alien surroundings.

The hoatzin, *Opisthocomis hoazin*

As I have mentioned, the nest of the hoatzin was invariably built over the water, and we shall later discover the reason for this. The nests were sometimes only four feet above high water, or equally rarely, at a height of forty to fifty feet. From six to fifteen feet included the zone of four-fifths of the nests of these birds. They varied much in solidity, some being frail and loosely together, the dry, dead sticks which composed them dropping apart almost at a touch. Usually they were as well knitted as a heron's, and in about half the cases consisted of a recent nest built upon the foundations of an old one. There was hardly any cavity at the top, and the coarse network of sticks looked like a precarious resting place for eggs and an exceedingly uncomfortable one for young birds.

When we approached a nest, the occupant paid

no attention until we actually came close to a branch, or shook it. She then rose, protesting hoarsely, and lifting wings and tail as she croaked. At the last moment, often when only a yard away, she flew off and away to a distance of fifty feet or more. Watching closely, when she realized that we really had intentions on her nest, she returned and perched fifteen or twenty feet away, croaking continually, her mate a little farther off, and all the hoatzins within sight or hearing joining in sympathetic disharmony, all with synchronous lifting of tail and wings at each utterance.

The voice of the female is appreciably deeper than that of the male, having more of a gurgling character, like one of the notes of a curassow. The usual note of both sexes is an unwritable, hoarse, creaking sound, quite cicada or frog-like.

Their tameness was astounding, and they would often sit unmoved, while we were walking noisily about, or focusing the camera within two yards. If several were sitting on a branch and one was shot, the others would often show no symptoms of concern or alarm, either at the noise of the gun or the fall of their companion. A hoatzin which may have been crouched close to the slain bird would continue to preen its plumage without a glance downward. When the young had attained their full plumage it was almost impossible to distinguish them from the older members of the flock except by their generally smaller size.

But the heart of our interest in the hoatzins centered in the nestlings. Some kind Providence directed the time of our visit, which I chose against the advice of some of the very inhabitants of New Amsterdam. It turned out that we were on the scene exactly at the right time. A week either way would have yielded much poorer results. The nestlings, in seven occupied nests, observed as we drifted along shore, or landed and climbed among the thorns, were in an almost identical stage of development. In fact, the greatest difference in size occurred between two nestlings of the same brood. Their down was a thin, scanty, fuzzy covering, and the flight feathers were less than a half-inch in length. No age would have showed to better advantage every movement of wings or head.

When a mother hoatzin took reluctant flight from her nest, the young bird at once stood up-right and looked curiously in every direction. No slacker he, crouching flat or awaiting his mother's directing cries. From the moment he was left alone he began to depend upon the warnings and signs which his great beady eyes and skinny ears conveyed to him. Hawks and vultures had swept low over his nest and mother unheeded. Coolies in their boats had paddled underneath with no more than a glance upward. Throughout his week of life, as through his parents' and their parents' parents' lives, no danger had disturbed their peaceful existence. Only for a sudden windstorm such as that which the week before had upset nests and blown out eggs, it might be said that for the little hoatzin chicks life held nothing but siestas and munchings of pimpler leaves.

But one little hoatzin, if he had any thoughts such as these, failed to count on the invariable exceptions to every rule, for this day the totally unexpected happened. Fate, in the shape of enthusiastic scientists, descended upon him. He was not for a second non-

If we had concentrated upon him a thousand strong, by boats and by land, he would have fought the good fight for freedom and life as calmly as he waged it against us. And we found him no mean antagonist, and far from reptilian in his ability to meet new and unforeseen conditions.

His mother, who a moment before had been packing his capacious little crop with predigested pimpler leaves, had now flown off to an adjoining group of mangroves, where she and his father croaked to him hoarse encouragement. His flight feathers hardly reached beyond his finger-tips, and his body was covered with a sparse coating of sooty black down. So there could be no resort to flight. He must defend himself, bound to earth like his assailants.

Hardly had his mother left when his comical head, with thick, blunt beak and large intelligent eyes, appeared over the rim of the nest. His alert expression was increased by the suspicion of a crest on his crown where the down was slightly longer. Higher and higher rose his head, supported on a neck of extraordinary length and thinness. No more than this was needed to mark his absurd resemblance to some strange, extinct reptile. A young dinosaur must have looked much like this, while for all that my glance revealed, I might have been looking at a diminutive Galapagos tortoise. Indeed this simile came to mind often when I became more intimate with nestling hoatzins.

Sam, my black tree-climber, kicked off his shoes and began creeping along the horizontal limbs of the pimplers. At every step he felt carefully with a calloused sole in order to avoid the longer of the cruel thorns, and punctuated every yard with some gasp of pain or muttered personal prayer, "Pleas' doan' stick me, Thorns!"

At last his hand touched the branch, and it shook slightly. The young bird stretched his mittened hands high above his head and waved them a moment. With

similar intent a boxer or wrestler flexes his muscles and bends his body. One or two uncertain, forward steps brought the bird to the edge of the nest at the base of a small branch. There he stood, and raising one wing leaned heavily against the stem, bracing himself. My man climbed higher and the nest swayed violently.

Now the brave little hoatzin reached up to some tiny side twigs and aided by the projecting ends of dead sticks from the nest, he climbed with facility, his thumbs and forefingers apparently being of more aid than his feet. It was fascinating to see him ascend, stopping now and then to crane his head and neck far out, turtlewise. He met every difficulty with some new contortion of body or limbs, often with so quick or so subtle a shifting as to escape my scrutiny. The branch ended in a tiny crotch and here perforce, ended his attempt at escape by climbing. He stood on the swaying twig, one wing clutched tight, and braced himself with both feet.

Nearer and nearer crept Sam. Not a quiver on the part of the little hoatzin. We did not know it, but inside that ridiculous head there was definite decision as to a deadline. He watched the approach to this great, strange creature—this Danger, this thing so wholly new and foreign to the experience, and doubtless to all the generations of his forbears. A black hand grasped the thorny branch six feet from his perch, and like a flash he played his next trick—the only remaining one he knew, one that set him apart from all modern land birds, as the frog is set apart from the swallow.

The young hoatzin stood erect for an instant, and then both wings of the little bird were stretched straight back, not folded, bird-wise, but dangling loosely and reaching well beyond the body. For a considerable fraction of time he leaned forward. Then without effort, without apparent leap or jump he dived straight downward, as beautifully as a seal, direct as a plummet and very swiftly. There was a scarcely-noticeable splash, and as I gazed with real awe, I watched the widening ripples which undulated over the muddy water—the only trace of the whereabouts of the young bird.

It seemed as if no one, whether ornithologist, evolutionist, poet or philosopher could fail to be profoundly impressed at the sight we had seen. Here I was in a very real, a very modern boat, with the honk of motor horns sounding from the river road a few yards away through the bushes, in the shade of this tropical vegetation in the year nineteen hundred and sixteen; and yet the curtain of the past had been lifted and I had been permitted a glimpse of what must have been common in the millions of years ago. It was a tremendous thing, a wonderful thing to have seen, and it seemed to dwarf all the strange sights which had come to me in all other parts of the earth's wilderness. I had read of these habits and had expected them, but like one's first sight of a volcano in eruption, no reading or description prepares one for the actual phenomenon.

I sat silently watching for the re-appearance of the young bird. We tallied five pairs of eyes and yet many minutes passed before I saw the same little head and emaciated neck sticking out of the water alongside a bit of drift rubbish. The only visible thing was the protruding spikes of the bedraggled tail feathers. I worked the boat in toward the bird, half-heartedly, for I had made up my mind that this particular brave little bit of atavism deserved his freedom, so splendidly had he fought for it among the pimplers. Soon he ducked forward, dived out of sight and came up twenty feet away among an inextricable tangle of vines. I sent a little cheer of well wishing after him and we salvaged Sam.

Then we shoved out the boat and watched from a distance. Five or six minutes passed and a skinny, crooked, two-fingered mitten of an arm reared upward out of the muddy flood and the nestling, black and glistening, hauled itself out of water.

Thus must the first amphibian have climbed into the thin air. But the young hoatzin neither gasped nor shivered, and seemed as self-possessed as if this was a common occurrence in its life. There was not the slightest doubt however, that this was its first introduction to water. Yet it had dived from a height of fifteen feet, about fifty times its own length, as cleanly as a seal leaps from a berg. It was as if a human child should dive *two hundred feet!*

In fifteen minutes more it had climbed high above the water, and with unerring accuracy directly toward its natal bundle of sticks overhead. The mother now came close, and with hoarse rasping notes and frantic heaves of tail and wings lent encouragement. Just before we paddled from sight, when the little fellow had reached his last rung, he partly opened his beak and gave a little falsetto cry,—a clear, high tone, tailing off into a guttural rasp. His splendid courage had broken at last; he had nearly reached the nest and he was aching to put aside all this terrible responsibility, this pitting of his tiny might against such fearful odds. He wanted to be a helpless nestling again, to crouch on the springy bed of twigs with a feather comforter over him and be stuffed at will with delectable pimpler pap. Such is the normal right destiny of a hoatzin chick, and the *wheeog!* wrung from him by the reaction of safety seemed to voice all this. **FM**

"Morning—Oatka Creek," welded corten steel sculpture of green-backed heron by Craig Wilson. On view in "Birds in Art" exhibit closing May 22.

Costa Rica, Tropical Biology, And a Visit with Otón Jiménez

by William C. Burger
Curator of Vascular Plants

COSTA RICA, one of half a dozen small republics in Central America, has played a special role in the science of tropical biology. With mountains over 3,000 meters (10,000 feet) high, areas with more than 3 meters (10 feet) of rainfall a year, other areas with little or no rain for five months, and rich volcanic soils, little Costa Rica supports an extraordinary variety of plants and animals. Though less than half the size of Ohio, Costa Rica has over 1,200 species of orchids, and twice as many ferns as all of North America north of Mexico. This rich fauna and flora has provided many opportunities for biological research. In addition, the country has played an important role in the education of a new generation of tropical biologists.

About twenty years ago, the Organization for Tropical Studies (OTS), a consortium of colleges and universities, decided to base its educational program in Costa Rica. The OTS field stations, and especially its program of intensive field courses for graduate students, have been a great success. Many of North America's academic biologists, now concentrating their research efforts on problems in tropical biology and ecology, had their introduction to the tropics through the OTS program.

Costa Rica was a logical choice for such an educational effort. Within a two- or three-hour drive from San José, the capital, one can experience the seasonally dry deciduous forests of the lowland Pacific, the rain forests of the Caribbean coastal plain, the cooler cloud forests of the central highlands, or the treeless alpine formations on the highest mountaintops. This great variety of life-zones, and the wealth of plants and animals they support, have made the OTS courses an especially rich experience for hundreds of young biologists. But there are other reasons why Costa Rica has played a special role in the growth of our knowledge of tropical nature.

A long tradition of scholarly activity, an excellent university system, a highly literate and talented populace, and the very friendly nature of the people have made Costa Rica especially hospitable to visiting scientists. A stable political climate and accessibility to many kinds of natural habitats have been important factors. In addition, there has been a long tradition of collecting and research by the Costa Ricans themselves. For example, the herbarium of the Museo Nacional de Costa Rica holds more than 150,000 plant specimens, comprising a major resource for studying and understanding the country's flora. These collections have been gathered for nearly a century, and largely account for the fact that we know much more about the flora of Costa Rica than we do of most other tropical regions. Likewise, important collections of insects, birds, and mammals are housed in the National Museum and at the National University. Much of this heritage has come from the work of resident biologists, who know the local flora and fauna intimately. Some, like the ornithologist Alexander Skutch, have become world famous for their research. Originally from the United States, Dr. Skutch has lived in Costa Rica for more than fifty years. This tradition of scholarship is continuing with young Costa Rican biologists who are becoming expert in the fauna and flora of their country.

The Botany Department of Field Museum has been active in research on Costa Rica's flora for more than half a century. The Museum published former Botany curator Paul Standley's *Flora of Costa Rica* in 1937-38. This 4-volume, 1,570-page compendium is still a major source of information about Costa Rica's

plant life. A program to develop a modern detailed flora was begun here at the Museum in 1965 and continues to the present. Active fieldwork, in collaboration with our Costa Rican colleagues, complements research on collections and literature. The plant specimens housed at Field Museum and in Costa Rica are a primary data base for our study of that country's flora. The diversity of habitats in Costa Rica require that we continue to collect actively; many areas are still poorly known and new species continue to be discovered. However, on our last trip in February, we took time out from ventures into rain forests and cloud forests for a very different kind of visit.

Our destination was a stately old home near the center of the capital city. Five of us (the director of the National Museum, her assistant, and three botanists) paid a visit to Don Otón Jiménez. While Don Otón had been a pharmacist for most of his life, he had also done botanical collecting over many years and knew most of the biologists who were active in Costa Rica in the earlier decades of this century. Though now confined to a wheelchair, Don Otón greeted us cheerfully. He answered many questions about the early collectors he had known and reminisced about his youth and family. He spoke slowly, but forcefully and often with humor, recalling people and episodes from many years ago. He clarified details regarding the early history of the National Museum, and commented on the personalities of the biologists he had known.

For our visit, we had brought along a very special plant specimen from the National Museum: the type specimen of *Ficus jimenezii*. This is the specimen which was used to establish the new name for a species of tree in the fig genus. It had been named in honor of Otón Jiménez, who was still a teenager at the time he collected it. The reason for bringing the specimen, and for photographing Don Otón with his early collection, was as a remembrance of his contributions to our knowledge of Costa Rica's flora. What made the occasion remarkable is that he had collected the type of *Ficus jimenezii* in 1910! Now, 78 years later, he was still able to share with us his memories of more than 90 years. The clarity of his mind, his vigorous speech and good humor made our visit especially memorable.

After more than two hours of animated conversation, we said farewell to Don Otón and the members of his family who care for him. Our visit had given us new insights into the earlier days of biological activities in Costa Rica, and we couldn't help but admire Don Otón's warm personality and sprightly recollections. His recorded reminiscences will become part of the archives of the National Museum, and his type specimen will continue to serve as the basis for the name of one of Central America's distinctive highland trees. This specimen and the other 150,000 specimens at the National Museum are the physical basis on which our inventory of Costa Rica's plant life is based. Through the acquisition and exchange of duplicated specimens, Field Museum and other major institutions share the responsibility of caring for these important research resources. Like libraries, museums cherish their older collections as well as the latest additions. How fortunate it is, then, to have someone still with us who has witnessed the growth and development of these collections through most of this century.

Don Otón Jiménez Bill Burger

With active ongoing programs of research by Costa Rican and visiting scientists, this democratic republic continues to play a major role in tropical biology. A large system of national parks and active programs of nature preservation by government, as well as by private groups, should ensure the future of biological research in Costa Rica for many years to come. Tourists, also, are increasing in numbers as they hear of Costa Rica's natural beauty and efforts to preserve it. **FM**

37th Annual Members' Night

Friday, May 6
5:00-10:00 pm

We're so excited about May 6 that we're cleaning the elephants, polishing the marble, and opening all the usual off-limit areas in preparation for your arrival. Join us on Members' Night to visit with our curators, researchers, and entire Museum staff and find out what they know about working with 18,000,000 specimens.

There will be special exhibits, activities, and entertainment all evening, including children from the Indian Classical Dance School, musicians from the Chinese Music Society, and members of Ars Subtilior Ensemble performing music from the Middle Ages and Renaissance.

If you are coming by car, you may park free of charge in the Museum's parking lots or Soldier Field lot. Simply show your Member card or invitation.

Free bus service will be operating between the Loop and our south door. These Willett buses, marked "Field Museum," will originate at the Canal Street entrance of Union Station (Canal at Jackson) and stop at the Canal Street entrance of Northwestern Station (Canal at Washington); Washington and State; Washington and Michigan; Adams and Michigan; Balbo and Michigan. Buses will begin running at 4:45 p.m. and continue at approximately 20-minute intervals until the Museum closes at 10:00 p.m. You may board the free "Field Museum" Willett bus by showing your Member card or invitation.

Members are invited to bring family and up to four guests. Special arrangements for handicapped persons can be made by calling 922-9410, ext. 453, beginning April 25. "Behind-the-Scenes" activities will end at 9:00 p.m.

Don't miss Members' Night—we'll be expecting you!

Cleaning the Elephants, August 1952

78971

We... gottah, wannah, gointuh, should, must, will... see _____ !!!!!!

by Alan Solem, *Curator of Invertebrates*
and W. Peyton Fawcett, *Librarian*

IT WAS MIDAFTERNOON on a museum free day. The school buses had departed, leaving mainly family groups in circulation. As one of us (A.S.) waited for the elevator, a family wandered up. The two children were starting to whine, and all clearly were suffering from "museum feet." But the father's sharp sentences —"*No!!!* We're not leaving until we see Bushman. My parents took me to Lincoln Park Zoo many times to see him when I was your age, and I'm going to visit him again today!!!"—loosed a flood of memories concerning my own childhood visits: of seeing Harwa, the Egyptian mummy, x-rayed; of peering around adults to catch a glimpse of the giant panda, Su-lin, first seen alive at Brookfield Zoo and now stuffed and mounted in a glass case; of hearing my grandmother talk of her visit years before to see the man-eating lions of Tsavo.

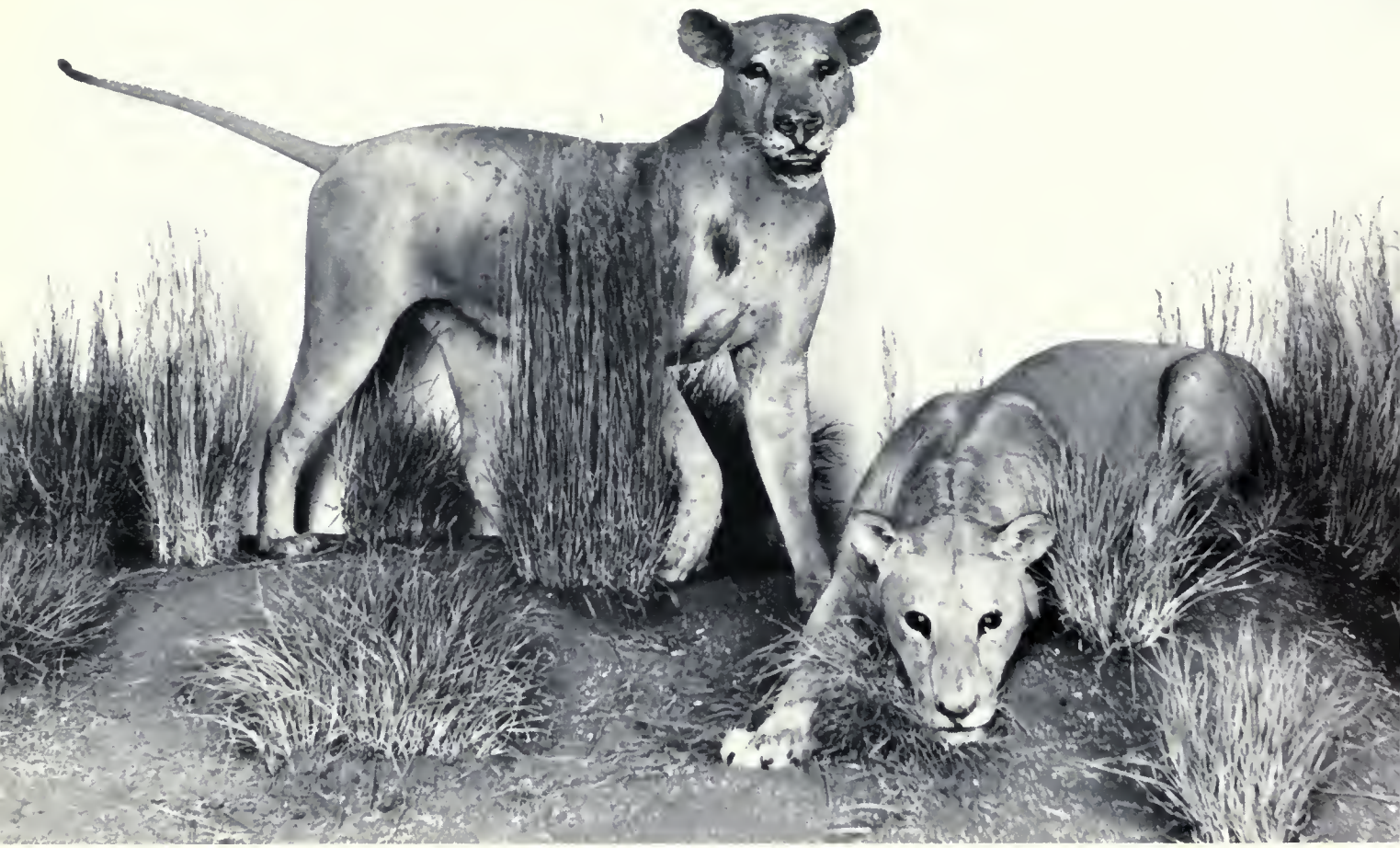
In addition to "museum feet," one often comes

away from a museum visit with a kaleidoscopic mixture of images and impressions, sensory overload, even a headache. What we remember of these visits depends on our interests, backgrounds, and a degree of happenstance. But there are exhibits or objects that have nearly universal appeal. They are remembered long after the visit, and may survive as the only lasting memory. Bushman, the gentle giant, is perhaps our current star; but there have been others over the years, and what follows is a brief, selective, very personal, and roughly chronological guide to them.

Still poised in combat, the "trademark" fighting elephants, centerpiece of Stanley Field Hall, are one of the great triumphs of taxidermy. As with many of our mounted animals, they are the legacy of Carl Akeley, who revolutionized the art of taxidermy, first at Field Museum and later at the American Museum of Natural History. Collected by Akeley during July and August 1906 in Kenya as part of a Field Museum expedition, they were the first large mammals mounted using his new techniques. The weeks of observing elephants in Africa and the use of photographs taken in the field aided him in recreating the feeling of "life in motion," and in successfully posing them in a dramatic and lifelike manner. Placed on display in 1909, they introduced a new era in museum exhibition. The elephants successfully survived "moving day" in 1921, when shifted by rail from the original building—now the site of the Museum of Science and Industry—to the present one, and a mid-1970s shift up onto their current pedestal. How many visitors, or even staff members, are aware that they are seeing perhaps the first example of modern taxidermy, a true wonder of its time?

Our next superstars also were from Kenya—actually they lived there in 1898, eight years before Akeley's elephant hunt. As related by Col. J. H. Patterson in his 1914 book *The Man-Eaters of Tsavo*, and again in the Museum's Zoology Leaflet No. 7, *The Man-eating Lions of Tsavo*, two lions "killed and devoured, under the most appalling circumstances, one hundred and thirty-five Indian and African artisans and laborers employed in the construction of the Uganda Railway." For over nine months, their reign of terror continued, ended by their death from the rifle of Col. Patterson. A quarter-century later, in 1924, Col. Patterson gave a public lecture at Field Museum. Upon learning that the lion skins —reportedly used essentially as decorator rugs —were still in Col. Patterson's possession, Field

Close-up of Carl Akeley's fighting elephants in Stanley Field Hall 81696



The Tsavo lions 49983

Museum President Stanley Field purchased the skins. "With considerable difficulty, owing to the age of the skins (and poor preservation techniques of the time!), they were mounted and are now permanently preserved in the spirited group" located near the African water hole group in the African Mammals hall (Hall 22). For perhaps 15 years they retained their primary appeal.

The giant panda, emblem of the World Wildlife Fund, today is a symbol of endangered species everywhere. In the 1920s, this rare animal of western China was eagerly sought for museum collections. Only a few specimens had been collected, and they were somewhat imperfect and badly preserved. Field Museum's two giant pandas on display in the Asian Mammal Hall were collected by the William V. Kelley-Roosevelt's Expedition in 1929. After the skins arrived in Chicago, they were mounted, placed on exhibit, but achieved little notice initially. On February 8, 1937 "panda-mania" began with the arrival at Brookfield Zoo of the first living giant panda seen in the United States, Su-lin. Only then did our mounted examples become popular. Su-lin, believed to be a female, was a most popular attraction at Brookfield Zoo. When "she" died in April 1938, "her" body was brought to Field Museum, where it was discovered that "she" was a "he." The skin was mounted, and can be seen today in the Mammals of the World exhibit (Hall 15). The body became the object of two decades of study (interrupted, from time to time, by military service and other projects) by D. Dwight Davis, curator of Comparative Anatomy. While visitors came to see Su-lin and, more often than not, thought one of the pandas in the habitat group was their "friend," meticulous dissection, study, illustration, and writing took place on upper floors. Davis's resulting 327-page monograph, "The Giant Panda," published by Field Museum Press as volume 3 of *Fieldiana: Zoology Memoirs* in 1964, was the culmination of his research career. Judged by famed Harvard paleontologist Stephen Jay Gould as "probably the greatest work of modern evolutionary comparative anatomy," this set a standard that has not been met, much less exceeded, subsequently. Few readers of this article will have heard of Davis and his monograph, but its fame among scientists will last generations after

the last viewer of Su-lin has ceased telling great-grandchildren of the excitement he caused.

During the 1940s, shortly after Su-lin appeared on display, the pandas had major competition at Field Museum. Egyptian mummies, their tombs and contents, have long inspired both fear and fascination. Field Museum's Egyptian Hall (Hall J) continues to be one of the most popular exhibits. Visitors stand silently in front of the mummies or joke edgily, in the manner of one whistling past the graveyard late at night, or with mental visions of Boris Karlov as "The Mummy" seen on late night TV. In 1941 the mummy of Harwa, an Egyptian agricultural official who lived 2,800 years ago, was placed on display. Visitors to the "Chamber of Harwa" observed "Harwa in his ancient wrappings. His head, still covered with its dried original skin, is exposed... The chamber gradually darkens, the screen shifts silently in front of the mummy, then lights up, and there, in life-size, appears the image of Harwa's skeleton." We can both attest that this was a spectacle not to be forgotten. Field Museum was a pioneer in developing and successfully applying x-ray photography to the study of mummies and other museum specimens.

D. Dwight Davis, late curator of Comparative Anatomy and author of the historic monograph "The Giant Panda." 87164

Giant panda habitat group 81165

The redoubtable Harwa, Egyptian agricultural official who lived 2,800 years ago. 87633

And who can forget the gold mask of Tutankhamun and the other treasures exhibited in 1977 or the smaller exhibition of 1959? Since its rediscovery many years ago, "King Tut's Tomb" has captured the imagination of several generations. These two opportunities for Chicagoland residents to see some of the legend-laden treasures produced near-stampedes. Between April 15 and August 15, 1977, approximately 1,500,000 visitors swarmed through the Museum. Lines of visitors snaked around the Museum and there was usually some confusion as to where the lines ended. Staff members were well advised to let everybody know as they were entering the building that "We *work* here!" and were *not* trying to crash the line!

For one of us (A.S.), the exhibit produced a major culture shock. From August 1976 to June 1977 I had been in Australia, much of the time living out of the back of a Landrover, in the middle of nowhere, at most with two other people. Return to Chicago via Sydney, Honolulu, and San Francisco involved only change of planes, some unease at crowds, and arrival in Chicago late on a Sunday. A Monday morning bus ride to Field Museum—and the 5,000 to 7,000 people lined up to get "Tut Tickets" for that day, resulted in immediate wish for miraculous instant return to the Australian Outback!

Harwa is no longer on display, and the treasures of Tutankhamun have returned to Cairo. The elephants, the man-eating lions, and Su-lin are still on display. But our most popular feature at present remains Bushman. For over 20 years he delighted visitors to Lincoln Park Zoo (an estimated 3,000,000 per year). Upon his death at an estimated age of 23, on January 1, 1951, his body came to Field Museum, and was mounted by the last of our great taxidermists, Leon L. Walters, with the assistance of Frank C. Wonder and Joseph B. Krstolich. Today, 36 years after being put on display, he still has his fans and frequent visitors. One of us (W.P.F.) recently met by chance a friend from Army days. We had not seen each other for 28 years. When I told him that I worked at Field Museum, he exclaimed: "Is Bushman still there?" In-

Waiting for King Tut

Ron Testa

deed he still is, in a new location on the ground floor near the children's shop.

But what will take his place in AD 2000? Will Bushman be as nearly forgotten as are the man-eating lions today?—since time will continue to thin the ranks of those who saw Bushman alive. Bits of moon rock, invaluable gems, fascinating special exhibits have come and gone, but nothing seems to have reached our public to compare with the fame chronicled above. Have times changed? Is the kind of interest and fascination that made these stars in our first century still possible? Have television wildlife documentaries and the ease of travel to far corners of the world jaded our interest in the static displays of nature —however cunningly contrived?

We have discussed and argued this between us—which led us to write this article.

What do *you* think could (or should) be the exhibit stars in the year 2000? Probably we do not yet have them on display. But we would like your ideas for future hits. Please write to us. If the response warrants, we'll report back to you on the suggestions—and perhaps include one or two ideas of our own.

You represent the core of our supportive audience, and we need your ideas. **FM**

The awesome gold mummy mask of Egyptian king Tutankhamun being installed at Field Museum in 1977 by representative of the Cairo Museum 82537

"Ramesses The Great" Tour

Saturday, July 2 to Tuesday, July 5

Boston Museum of Science

FIELD MUSEUM TOURS

THE EXHIBITION OF RAMESSES THE GREAT, on loan from Cairo's world-famous Egyptian Museum, is the largest assemblage of Egypt's national treasures to ever visit the United States (artifacts outnumber the Tutankhamun exhibition). The exhibit will be shown at the Boston Museum of Science April 30 through August 30, 1988. We invite you to take advantage of the opportunity to see this spectacular exhibit while it is in our country, and to celebrate the Fourth of July in Boston at *Harborfest '87.* The schedule of special events for this five-day festival is extensive, with many of the activities being free. A highlight will be the Boston Pops concert on the Esplanade, and the Fourth of July fireworks display.

Our Itinerary:

Saturday July 2 Depart Chicago O'Hare airport on United Airlines breakfast flight #684 at 8:30 a.m. Flight is nonstop to Boston Logan Airport. Upon arrival at 11:45 we'll be met by our guide, and we'll enjoy a tour of some of Boston's highlights by deluxe motorcoach. (Your luggage will be taken directly to the Park Plaza Hotel.) Mid-afternoon we'll check into the Park Plaza Hotel for a period of relaxation before dinner. This evening we board "The Spirit of Boston" for a harbor dinner cruise, which will include festive entertainment and dancing.

Sunday July 3 Day at leisure to give you the opportunity to enjoy some of the special events of Harborfest. This evening we'll go to the Museum of Science to tour the Ramesses exhibit with Del Nord, Egyptologist, as our guide. Many of you will remember Ms. Nord from the Tutankhamun era at Field Museum. She led many Egypt tours from 1976 to 1984 for Field Museum/ Oriental Institute. According to a number of tour members, Del is a professional of the highest calibre, and an asset to Egyptology. She truly loves Egypt and the history and culture of this fabulous land. Dinner on your own. There is a choice of three restaurants in the Museum.

Monday July 4 This morning we'll take a motorcoach tour to Cambridge, Lexington, and Concord, including stops at several historic sites, one being the "Old Manse" home of author Nathaniel Hawthorne. We'll enjoy lunch at the historic Colonial Inn, built in 1772. The afternoon will be at leisure. The highlight of the evening will be the famous Boston Pops esplanade concert, with a box dinner provided.

Tuesday July 5 We'll depart Logan Airport on United Airlines flight #393 at 9:30 a.m., flying nonstop to Chicago O'Hare and arriving at 11:15 a.m.

We hope you will join Field Museum's tour group for this trip to Boston. The cost is $895.00 per person (double occupancy), single supplement $330.00. Early reservations will ensure your enrollment at this price, which is based on 30-day advance purchase of air tickets. A deposit of $200.00 per person, payable to Field Museum Tours, will hold space in the order reservations are received. Our group will be limited to 30 participants. For further information please call 322-8862.

Spaces still available for. . .

Voyage to The Gulf of St. Lawrence and Canada's Maritime Provinces

Aboard the *Illiria*
July 1-9, 1988
Accompanied by Dr. David Willard, Field Museum Zoologist

← COLOSSUS OF RAMESSES THE GREAT. Lost for centuries, this magnificent colossus was uncovered in 1962 and restored for the "Ramesses The Great" exhibit. The massive, 57-ton, 25-foot statue is the largest ever restored and shipped out of Egypt. On view at the Boston Museum of Science April 30-August 30.

For reservations, call or write Dorothy Roder (322-8862), Tours Manager, Field Museum, Roosevelt Rd. at Lake Shore Dr., Chicago, Il 60605

Field Museum of Natural History
Membership Department
Roosevelt Road at Lake Shore Drive
Chicago, IL 60605-2499

FIELD MUSEUM OF NATURAL HISTORY BULLETIN

June 1988

Traditions in Japanese Art: The Boone Collection

Opens June 22

Field Museum of Natural History Bulletin

Published since 1930 by
Field Museum of Natural History
Founded 1893

Editor/Designer: David M. Walsten
Production Liaison: Pamela Stearns
Staff Photographer: Ron Testa

BOARD OF TRUSTEES

Robert A. Pritzker
Chairman
Mrs. T. Stanton Armour
George R. Baker
Robert O. Bass
Gordon Bent
Mrs. Philip D. Block III
Willard L. Boyd,
President
Robert D. Cadieux
Worley H. Clark
James W. Compton
Frank W. Considine
William R. Dickinson, Jr.
Thomas E. Donnelley II
Thomas J. Eyerman
Marshall Field
Ronald J. Gidwitz
Clarence E. Johnson
Richard M. Jones
John James Kinsella
Robert D. Kolar
Hugo J. Melvoin
Leo F. Mullin
James J. O'Connor
Mrs. James J. O'Connor
James H. Ransom
John S. Runnells
Patrick G. Ryan
William L. Searle
Robert H. Strotz
Mrs. Theodore D. Tieken
E. Leland Webber
Blaine J. Yarrington

LIFE TRUSTEES

Harry O. Bercher
Bowen Blair
Stanton R. Cook
Mrs. Edwin J. DeCosta
Mrs. David W. Grainger
Clifford C. Gregg
Mrs. Robert S. Hartman
Edward Byron Smith
John W. Sullivan
J. Howard Wood

CONTENTS

June 1988
Volume 59, Number 6

JUNE EVENTS AT FIELD MUSEUM 3

TRADITIONS IN JAPANESE ART: THE BOONE COLLECTION
Exhibit opens June 22, closes October 2
by Suzanne Arata and Caroline Moore, consultants in Japanese art, Department of Anthropology; photography by Ron Testa and Diane Alexander White, Division of Photography. 6

TWENTY YEARS OF VOLUNTEERS
by Ellen Zebrun, Volunteer Coordinator 27

FIELD MUSEUM TOURS
Featuring a trip to Boston and a special viewing of "Ramesses the Great" exhibit at the Boston Museum of Science 31

COVER (front and back)

"Happiness Unlimited," painting by Japanese artist Dōhō Kōji (Taisho period, dated 1917), ink and color on silk, 77½ × 27 in. The entire painting is reproduced on the back cover; detail is on the front cover. This painting and about 130 other works of Japanese art will be on view in Gallery 9A beginning June 22, comprising the exhibit "Traditions in Japanese Art: The Boone Collection." They have been selected from about 3,500 paintings and other works of art donated to Field Museum by Katherine Phelps Boone and the late Commander Gilbert E. Boone. See pages 6-26.

"Happiness Unlimited" exudes just that. It depicts Ebisu, a laughing, happy god, in great multitude and engaged in a myriad of activities for amusement and leisure: writing poems or practicing calligraphy, singing, dancing, and making merry with his fellows, playing musical instruments, playing a game of *go* or engaged in a tug-of-war, participating in tea ceremony, tallying receipts on the abacus, and so forth. All of these activities are associated with the New Year and with Ebisu Matsuri, a festival honoring Ebisu held in western Japan either on the fifth or tenth of January. The little-known artist Dōhō Kōji ("the Laymonk Dōhō") displays a certain deliberate awkwardness and yet uninhibited style of brushwork, which contributes to the fresh, lighthearted tone of the painting.

Ebisu wears a soft cloth cap and is usually shown seated with a fat *tai* (sea bream), seen in the lower right, and sometimes with a fishing pole. As one of the Seven Gods of Fortune, he is often depicted with the god Daikoku; both have been adopted as familiar household gods of good luck and plenty. Ebisu's origins are unknown, but legends describe him as making an arrival by sea as a stranger. He is worshipped all over Japan but particularly in fishing villages where he is believed to bring bountiful catches from the sea. Ebisu has also been adopted by farming communities, where he is revered as an agricultural god and by merchants for whom he represents honest dealing. Cat. 265982, negs. 110820 (front), 110817 (back).

Field Museum of Natural History Bulletin (USPS 898-940) is published monthly, except combined July/August issue, by Field Museum of Natural History, Roosevelt Road at Lake Shore Drive, Chicago, IL 60605-2496.

Copyright ©1988 Field Museum of Natural History.

Subscriptions: $6.00 annually. $3.00 for schools. Museum membership includes *Bulletin* subscription. Opinions expressed by authors are their own and do not necessarily reflect the policy of Field Museum. Unsolicited manuscripts are welcome. Museum phone: (312) 922-9410. Notification of address change should include address label and be sent to Membership Department. Postmaster: Please send form 3579 to Field Museum of Natural History, Roosevelt Road at Lake Shore Drive, Chicago, IL 60605-2496. ISSN: 0015-0703. Second class postage paid at Chicago, Illinois and additional mailing office.

EVENTS

Kanda Myojin Masakado Taiko —Japanese Drumming

Saturday and Sunday
June 25 and 26, 2:00pm

IN CELEBRATION OF JAPAN FESTIVAL Field Museum presents Kanda Myojin Masakado Taiko, an all-female group performing on the *taiko,* or Japanese drum, from the Kanda Myojin Shinto shrine in Tokyo. This six-member group was established 15 years ago. They are dedicated to preserving the traditional performance of taiko and to making the centuries-old taiko music more appealing to contemporary society. Their performance features five pieces: "The Lion Dance," performed by all six members, "Torches," based on the tragic life of Taira no Masakado, to whom the Kanda Myojin shrine is dedicated, "Bando Arashi" ("Windstorm of Bando"), "Celebration," and "Kanda Taiko," a more contemporary piece reminiscent of Jazz. Each performance is free with Museum admission. Tickets are not required.

World Music

Weekends in June
1:00pm and 3:00pm

MUSIC COMMUNICATES in many ways. It is something that can be shared by all of us, whether or not we have common lifestyles, beliefs, or even languages. June is a musical celebration month at Field Museum.

June 4, 5

1:00pm **Chinese Music Society of North America,** demonstrates instruments from the Chinese orchestra

3:00pm **Ari Brown,** composer and performer, plays the saxophone

June 11, 12

1:00pm and 3:00pm **Don Moye** demonstrates African percussion instruments

June 18, 19

1:00pm **Jamila-Ra** presents poetry

3:00pm **Eli Hoenai,** African percussion

3:00pm **Fan Wei-Tsu** demonstrates the *zheng*, the Chinese zither

June 25, 26

1:00pm and 3:00pm **Don Pate** plays some exciting bass rhythms

The World Music Program is supported by the Kenneth and Harle Montgomery Fund and a City Arts III/IV grant from the Chicago Office of Fine Arts, Department of Cultural Affairs.

Continued ▷

EVENTS

Hall Interpreters Program

Thursdays through Sundays in June

THE "DOG DAYS" OF SUMMER are a great time to learn a few new tricks at Field Museum. In exciting hands-on programs, you make Egyptian papyrus paper, heft the ingenious drills and adzes of Native America, and play with the Chinese seven-piece puzzles that Lewis Carroll loved.

Hall Interpreters, dressed in blue aprons and located throughout the exhibits, help you and your friends experience the wonders of the world. Cool off with the hottest new theories about dinosaur extinction. Learn to weave without a loom. And see just what earthworms are up to under your lawn this summer.

These exciting programs, partially sponsored by the Joyce Foundation and the Lloyd A. Fry Foundation, are available to all Museum visitors Thursday through Sunday. Please consult the television monitors throughout the Museum for activity locations.

June Weekend Programs

EACH SATURDAY AND SUNDAY you are invited to explore the world of natural history at Field Museum. Free tours, demonstrations, and films related to ongoing exhibits at the Museum are designed for families and adults. Listed below is one of the numerous activities each weekend. Check the activity listing upon arrival for the complete schedule and program locations. The programs are partially supported by a grant from the Illinois Art Council.

June 11, 1:30pm: **Tibet Today and A Faith in Exile** (slide lecture)

Investigate Lhasa and refugees in Dharmsala (home of the Dalai Lama), Darjeeling, and Sikkim.

These programs are free with Museum admission and tickets are not required.

Summer Fun 1988

Summer workshops for 4-13 year-olds begin June 18. Workshop topics are as diverse as Field Museum's collections and offered Wednesday through Sunday until July 31. Advance registration is required. For a brochure and registration form call (312) 322-8854.

After Hours— Films at the Field

FREE!

Fridays in June

After Hours Cafe opens at 4:30pm
Films begin at 6:00pm

FIELD MUSEUM CONTINUES ITS PROGRAM of free contemporary feature films from around the world. Friday evenings in June offer films from Canada. After Hours Cafe opens at 4:30pm, serving light fare and beverages. Films begin at 6:00pm. Be sure to use the West Entrance. For more information call (312) 322-8855.

June 4

☐ "The Decline of the American Empire"
1987. 101 minutes. Color. Canada.
Director: Denys Arcand. French with English subtitles.

The Decline of the American Empire, a comedy about love and sex, focuses on eight French Canadian intellectuals gathered at a lakefront cottage for the weekend. As they discuss their lives with amusing candor, the characters begin to reveal their hidden, darker sides. With compassion and affection, the film exposes the psyches of its middle-aged subjects and their search for personal happiness.

☐ "Crac"
National Film Board of Canada
1982. 15 minutes. Color. Animated.
Director: Frederic Back.

A 1982 Oscar winner, this animated film portrays the experience of an old-fashioned rocking chair and its years with a French Canadian family. It is an affectionate visit to a happy past and a gentle commentary on the rapid pace of modern life.

June 10

☐ "Les Bons Debarras" ("Good Riddance")
1980. 112 minutes. Color. Canada.
Director: Francis Mankiewicz. French with English subtitles.

Manon is a thirteen-year-old with a terrific intelligence and a will to dominate everyone around her. Living with her single mother and slow-witted brother in rural Quebec, Manon willfully and exactingly turns the weaknesses of a child's position to her own advantage. As her mother struggles to maintain her happiness and dignity, a situation which seemed merely threatening becomes explosive and destructive.

☐ "The National Scream"
1980. 28 minutes. Color. Canada.
Director: Robert Awad and David Verrall.

A tongue-in-cheek look at Canada and the Canadians, this film explains how and why the beaver became the country's symbol. This lively satire uses animation and a pseudo-documentary style to depict Canada's search for a national identity.

EVENTS

Scene from "The Decline of the American Empire," a comedy to be shown on June 4

©1986 Cineplex Odeon Films, Inc.

June 17

☐ "Joshua Then and Now"
1985. 118 minutes. Color. Canada.
Director: Ted Kotcheff.

As his world collapses around him—his best friend dies, his brother-in-law commits suicide, and his wife leaves him—Joshua, a free-spirited, Jewish Canadian journalist, spends one day looking back on the events of his tumultuous life. In a series of colorful flashbacks, he reviews his childhood in Montreal, his years as a radical young political writer, and his courtship and marriage to a socially prominent daughter of a Protestant senator.

☐ "Propaganda Message"
1974. 13 minutes. Color. Canada.
Director: Barrie Nelson. French and English.

An animated look at the heterogeneous mixture of Canada and the invisible adhesive that holds them together. Dissenting voices are many, in English and French, but the message is also that Canadians can laugh at themselves and work out their problems.

June 24

☐ "Mon Oncle Antoine" ("My Uncle Antoine")
1971. 110 minutes. Color. Canada.
Director: Claude Jutra. French with English subtitles.

The story of a 14-year-old boy and his Christmas visit to a small Quebec mining town. He stays with his Uncle Antoine, who is the village store proprietor and community undertaker. It is a quiet film about coming of age, a memorable study in the simple universal experiences of love and fear, doubt, and death.

☐ "The Sweater"
1980. 10 minutes. Color. Animated. Canada.
Director: Sheldon Cohen.

Canadian author Roch Carrier narrates this funny, poignant story of his boyhood. In a style that evokes the period of the late 1940s, he recalls his passion for playing hockey and the great hockey star Rocket Richard.

Traditions in Japanese Art: The Boone Collection

by Suzanne Arata *and* Carolyn Moore
Consultants in Japanese Art, Department of Anthropology

photos by Ron Testa and Diane Alexander White

Katharine Phelps Boone and the late Commander Gilbert E. Boone formed the corpus of their rich and extensive collection of East Asian art during the late 1950s. Commander Boone was on a tour of duty in Japan in Naval Intelligence at that time. Katherine Boone, a civilian employee of Army Intelligence (1943-55), had become chairman of the Red Cross Gray Ladies at the Naval hospital in Yokosuka, Japan. The collecting of East Asian art had begun earlier for Commander Boone when he was stationed in Washington, D.C., from 1940 to 1951. It was the craftsmanship that had attracted him. Commander Boone's background in architecture heavily influenced his approach as a collector; it was his belief that true appreciation of a collected piece was largely determined by analysis of how it had been made.

While in Japan, the Boones began to organize their materials with the idea of creating a teaching collection. They decided to study with E. Y. Murakami, one of Japan's leading dealer-consultants in East Asian art, with whom they met for six hours each weekend for three years. After returning to the United States, Commander Boone retired from the service. Shortly afterward they began teaching at Monmouth College in Monmouth, Illinois and utilized their collection in courses dealing with various aspects of East Asian art.

The Boones' collection of more than 3,500 artifacts encompassing fine art, minor arts, and folk arts and crafts, has been donated to the Field Museum, adding significant dimension to the Museum's holdings in this area. It will provide an invaluable resource in enhancing our appreciation and understanding of Asian arts and cultures.

On view in Gallery 9A June 22 through October 2
Some 130 pieces will be shown, including those reproduced here

Returning from a Spring Outing
by Oda Kaisen (1785-1862)
Edo period, 19th century
Ink and color on silk
44 × 19 in.
Cat. 266019, Neg. 110807

Oda Kaisen was born into a family of dyers in Nagato (present-day Yamaguchi prefecture) and at the age of 22 moved to Kyoto. There he studied painting of the Shijō school, where realism was combined with the idealism of Nanga ("southern painting"). Nanga was practiced by the Japanese literati, who followed the lead of the Chinese scholar-painters without being totally bound by Chinese traditional rules or methods. Later, Kaisen went to Kyushu, where he studied Confucianism and Chinese painting, specializing in landscape, figure, and bird and flower subjects and was recognized as an expert colorist.

Landscapes depicting a scholar's house in a valley by a stream, with the owner and his two servants returning home after a day's journey, are typical of those found in Chinese Ming dynasty paintings (1368-1644). Old trees with exposed claw-like roots and the waterfall and rock formation in the center of the painting are reminiscent of earlier Chinese landscape traditions. However, rather than a harsh, foreboding mood, due at times to the political conditions that often affected the Chinese scholar-painter, this painting has a light, airy quality. The soft, warm, coloring of the peach trees and light tints and washes give the painting a clarity, appeal, and accessibility not seen in Chinese paintings. Perhaps this is attributable to Kaisen's sensitivity to color developed through his early training as a dyer.

Shōki,
the Demon Queller
by Kanō Sukenobu (1730-90)
Edo period, 18th century
Color on silk
44 × 24 in.
Cat. 266106, Neg. 110809

Shōki, the queller of demons, is a mythological figure who originated in Chinese legend but was adopted into Japanese repertoire as a popular subject, particularly during the Edo period (1615-1867). He is portrayed as an imposing, robust figure in military attire, wearing heavy boots and a cap with floppy "ears" and often chasing or subduing demons. During the Edo period it was not unusual to find satirizations of traditionally respected subjects, whether in the theater, in poetry and literature, or in the visual arts. While Shōki is often depicted in a somewhat unconventional and humorous light, here is a rare and most unusual view. He is portrayed standing behind his spirited horse with his back to us!

Kanō Sukenobu, better known as Eisenin II, was born and lived in Edo (Tokyo), becoming the fifth head of the Kanō school of artists at the Kobikichō atelier, the most predominant of three Kanō studios in Edo. The Kanō school, active since the 15th century, had come under the patronage of the military government and virtually dominated the art world, monopolizing the teaching of painting throughout the Edo period. Sukenobu was especially favored by the shogunate and was made a vassal directly under the shogun and official artist to the government in 1763. This painting is representative of the highly colorful academic style of the Kanō school, which had remained consistent throughout the years: a combination of intense color and decorative sense derived from Yamato-*e* traditions, with a reliance on linear elements, such as strong, vigorous ink outlines, brought together in a grand and large-scale vision.

Frolicking Animals

by Tosa Aimi (act. 1830-40)
Inscribed: "Following the style of Toba Sōjō"
Edo period, early 19th century
Ink and color on silk
37 × 12 in.
Cat. 266044, Neg. 110805

Aimi, a little known painter of the Tosa school, the latter-day inheritors of the courtly traditions of Japanese painting, has done what every painter for generations practiced. As the inscription reads, he has "copied" the famous 12th-century picture scroll *Chōjū jimbutsu giga* ("Scroll of Frolicking Animals and People"), attributed to the monk Toba Sōjō, a painting today classified as a National Treasure. Aimi's reinterpretation of the earlier scroll, however, differs from the original in two major respects. First, Aimi has very skillfully adapted the horizontal handscroll format into a vertical hanging one. Second and more importantly, he has transformed the earlier scroll into an elegant and precious evocation of classical traditions by downplaying brushwork—the predominant stylistic feature of the earlier work—and by emphasizing shapes and subtlety of color.

Aimi has very broadly divided his vertical composition into three areas: an archery exhibit at the top; a frog and hare with a pet boar, stopping to observe the archery contest in the middle; and a hare and a frog mischievously chasing a monkey at the bottom. All of this seems to be casually portrayed, but is carefully integrated, using the interaction of the animals, the placement of flowers and grasses, and the color with touches of gold to highlight the surface. In short, Aimi's painting, while it captures the wit and humor of the earlier masterpiece, reveals, rather, attitudes and sensibilities of the Tosa school painters in the Edo period (1615-1867) in their attempts to recapture earlier art traditions.

Flowers and Grasses of Autumn
by Matsumura Keibun (1779-1843)
Edo period, early 19th century
Ink and color on silk
82.5 × 26 in.
Cat. 265993, Neg. 110806

Seasonal themes are common in Japanese art. This painting seems to take as its subject autumn flowers and grasses (*akigusa*), one that dates to the courtly traditions of the Heian period (794-1185) and continued as a decorative motif throughout the centuries. Against a full autumn moon is depicted Japanese pampas grass, a delicate long-stemmed grass arching over and providing the backdrop for white chrysanthemums, the smaller blue Chinese balloon flowers and, oddly enough, in the middle of these, several beautiful pink peonies, a flower usually associated with spring. Insects crawl on the lower branches. All the elements are beautifully coordinated and composed into a conventional depiction of seasonal flowers, suggesting the special ambience of autumn in the moonlight.

Keibun, whose signature and seal can be seen in the lower left corner, was a member of the Shijō school of painting and was known for his paintings of birds and flowers. He studied with his elder brother, Matsumura Goshun, who was founder of the school, and with Maruyama Ōkyo, known for his more realistic style. During the last two decades of his life, Keibun became one of Kyoto's leading artists; he secured the position of the Shijō school as one of the most influential in the 19th century.

Ghost
by Kawanabe Gyōsai (1831-89)
Edo period, 19th century
Ink on paper
35 × 12 in.
Cat. 266070, Neg. 110811

Gyōsai was one of the most vigorous, creative, and well-known artists of his time. His life spanned from the late Edo period through the great changes brought on by the Meiji restoration. Born of samurai background, he was from an early age artistically precocious. He began studying with the popular *ukiyo-e* artist Utagawa Kuniyoshi and later with the Kano school, until he decided to become independent. Gyōsai's character was, like Hokusai's, notorious; he was emotional, self-willed, extremely eccentric, and given to drink. And for the same artistic qualities that Hokusai became popular—strong composition, skilled draughtsmanship, and a penchant for the grotesque and humorous—Gyōsai, too, was admired. His work included paintings, prints, sketches, and illustrated books. This painting, exhibiting the best of those qualities, is an example of his most accomplished work.

In Japan's richly developed tradition of the supernatural, it is when the spirit of a deceased person traveling from this world to the nether world resides in the world between these two, that he can become angry or spiteful and therefore reappear as a ghost to haunt others. A great many of these ghosts were female, depicted during the Edo period with long straight hair and waving or beckoning hands. Most wore clothing with long flowing sleeves loosely draped around a fragile figure; the head and upper part of the body were strongly delineated and from the waist down the form disappeared into a mist. This ghost, rendered in a monochrome ink technique, has dessicated almost completely into a skeletal specter, clearly defined from head to toe. Its arms are bent at the elbows, with the hands brought together in front of the chest. Its hair and teeth are still intact and the visage presents a suffering, mournful expression. Even more unusual, however, is the unique mounting, also painted in ink, suggesting a specific place by a stream with willows, eerily lit by the light of an obscured moon. The ghost may well be associated with a specific story, but which one is not identifiable at this time.

2

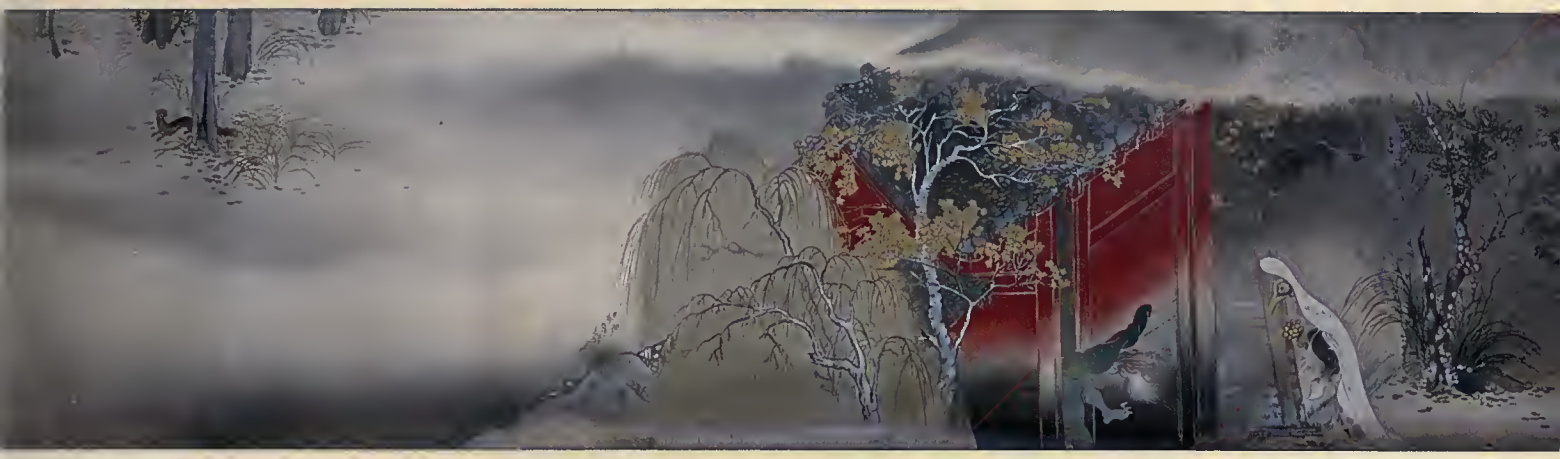
4

Scroll of Demons and Courtier
Signed: "Takemura"
Taisho period, dated 1918
Color on silk
Five illustrations, H. 16 in., L. 60 in. (each)
Cat. 266010, Negs. 110799-110803

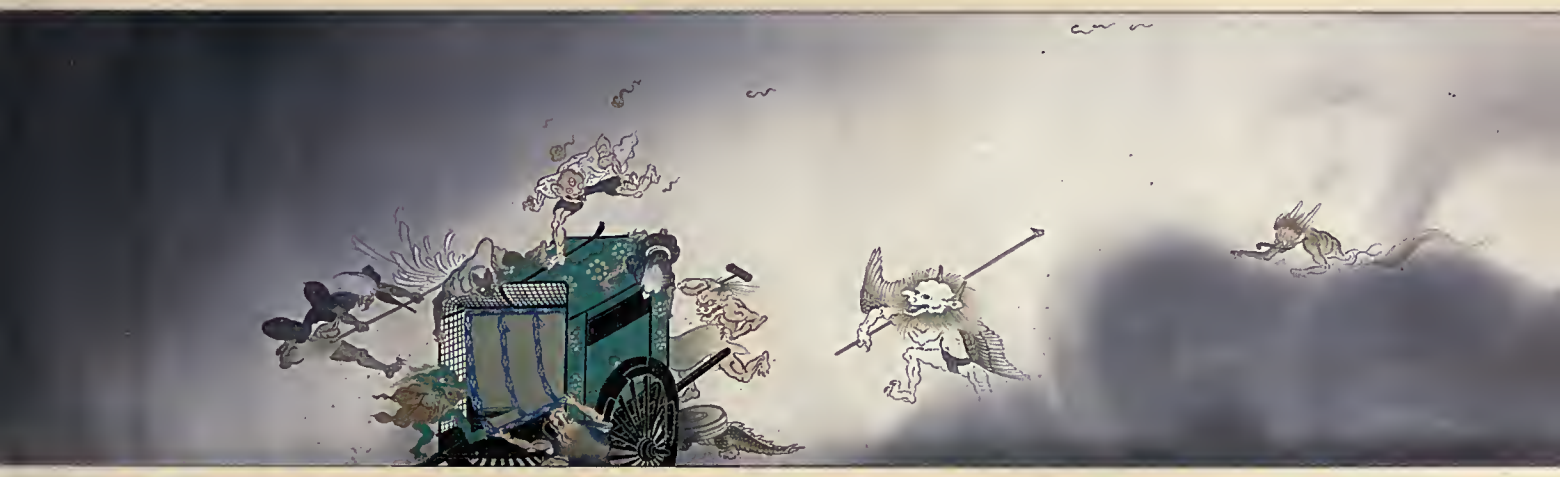
As this scroll is unrolled from right to left, five scenes of rich color and remarkable detail reveal a night of terror. (Follow numbers to the lower left of each panel.) Goblins and demons haunt an entrance gate in ruins. Still other horrifying beings race across a landscape of sparse grasses, passing a dilapidated roadside shrine. The tension mounts as we see these creatures in pursuit of a courtier's carriage, attacking it with violence and fury. Finally, as night passes into dawn we find the courtier, a serene figure with his eyes closed in dream or contemplation, holding his rosary and seated in a grassy plain as the rising sun burns the early morning dew.

It seems possible that the subject of this untitled handscroll alludes to a well-known story from the 10th-century classic of poem-tales, *Tales of Ise.* The setting is Musashi Plain, where an amorous young man runs off with a young girl but is about to be apprehended by a group of provincial officials. He hides the girl in a clump of bushes and flees; but the officials, thinking he must be nearby, decide to set fire to the surrounding plain in order to flush him out. The young girl cries out for her lover, thus alerting the officials who capture the two.

While the artist has drawn inspiration from ghost and goblin depictions that became popularized in the 18th and 19th centuries, particularly by artists like Gyōsai (see p. 11), the overall style of the painting in its use of intense colors and continuous action lies in the Yamato-*e* picture scroll traditions of the medieval period.



1



3

5

13

Monkey in the Rain
Signed: "Mori Sōsen" (1747-1821)
Edo period, 19th century
Ink and color on silk
8.5 × 10.5 in.
Cat. 226015, Neg. 110812

This painting was probably executed by a follower of Mori Sōsen, an artist who began his studies with the academic Kanō school but later favored the more realistic approach of the Maruyama and Shijō schools. He was a painter of animals but was famed for his extraordinary talent in depicting monkeys.

The example here, although lacking the strength of a true Sōsen painting, is typical of the manner for which Sōsen was famous. His monkeys are characterized by finely, softly delineated furry bodies with more strongly highlighted features in the face, hands, and feet, while suggesting the animal's underlying structure and form. This monkey relaxes on the edge of a grassy knoll in the midst of a light spring rain. More typical of Sōsen's work would be capturing the monkey in the midst of activity or mischief. Nonetheless, this monkey expresses a certain curiosity, registered in his eager, open-mouthed expression. The size of this painting suggests that it may have been part of what was originally a much larger painting and that the Sōsen signature and seal were added later.

The Archer, Nasu no Yoichi
by Yokoi Hōsai
Early 20th century
Color on silk
50.5 × 16.5 in.
Cat. 266077, Neg. 110807

An arrow, shot by a mounted archer, has just struck a fan which is seen flying through the air. The fan has broken loose from the ship. This is an allusion to a famous incident from the medieval tragedy *Tale of Heike*, which describes the battle between the Minamoto and Taira clans during the late 12th century.

The fan, which bears the design of *hi no maru*, the sun disc, was presented to the child emperor of the Taira, the ruling family, after they were driven from the capital, Kyoto, by the Minamoto in 1182. The fan was said to be symbolic of the spirit of the dead emperor and magically empowered to deflect arrows back upon the enemy. Thus, with the fan attached to the mast of the Taira ship, a challenge was sent to the Minamoto clan. Nasu no Yoichi, a skilled archer, responded to the challenge, rode on horseback into the waves and struck the fan with his arrow, achieving a signal victory for the Minamoto.

This painting is carefully controlled in both composition and style. The logically receding size of objects, leading the viewer's eye back into the far distance, and the fine rendering of each element with historical accuracy suggests Western influence.

Little is known of Hōsai except that he was a Tokyo painter specializing in historical subjects, who studied with the popular Tsukioka Yoshitoshi (1839-92), one of the last of the great printmakers. Yoshitoshi himself worked in a mixture of *ukiyo-e* and Yamato-*e*, and his work reflects an increasing Western influence with historical and heroic subjects. In these respects it would appear that Hōsai followed the master.

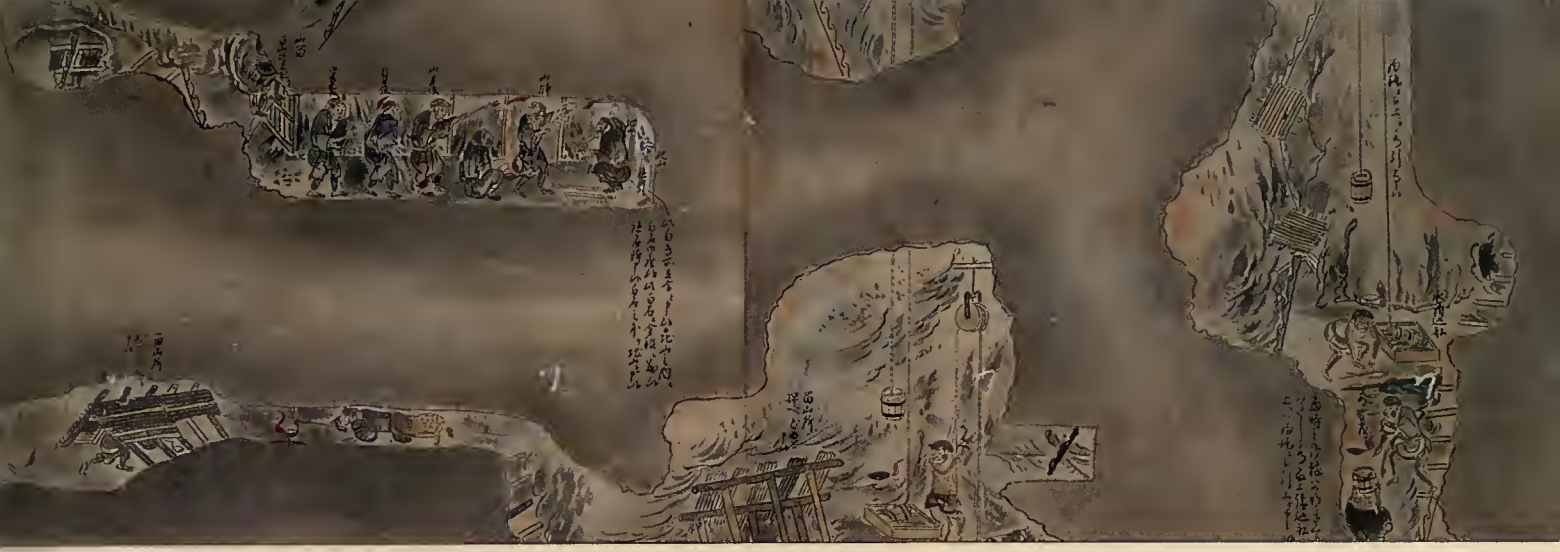
Deer

Inscribed: "Hong Shou, called 'Old Lotus,' writes this at the Shen Liu Studio on a wintry day in the year 1645."
Edo period, 18th century
Ink and color on silk
61 × 22 in.
Cat. 266040, Neg. 110804

Although the inscription indicates that this painting was executed in China during the mid-17th century and its style and composition appears to have a Chinese origin, it is more likely that this is a Japanese painting of the 18th century. Deer as a painting subject was simply not popular in China during that time and few paintings of deer by well-known Chinese painters of the period are documented. Furthermore, several features of the deer in this painting indicate that they are native to Japan.

The *shika,* or the deer of Japan and Manchuria, are medium-sized animals related to the "true deer" (the red deer or fallow deer), of Britain. However, Japanese deer have antlers that are smaller, with fewer points, as well as a coat that is spotted yellowish-white in summer with a black-bordered white area near the tail. It is clear that the deer portrayed are native to Japan and that they are shown here with their summer coat of yellowish-white spots.

Deer paintings were executed in the 18th and 19th centuries by Mori Sōsen, Kishi Ganku, and others. This was in part due to the influence of the Chinese artist Shen Nanpin, who worked in Nagasaki from 1731 to 1733 and introduced Western methods of painting to Japan. He had developed a following among Japanese painters; moreover, many of his works, mostly of deer, have survived. Thus, it seems most likely that the artist of this painting was inspired either directly or indirectly by the Chinese artist's work.



Gold Mining on Sado Island
Artist Unknown
Edo period, 19th century
Ink and color on paper
Two handscrolls, H. 10.5 in., L. 30 ft. (each)
Cat. 266123, Negs. 110815, 110816

Matsuo Bashō (1644-94), one of Japan's leading poets of the Edo period, wrote of Sado Island: "From the place called Izumozaki in the province of Echigo, Sado Island, it's said, is eighteen *li* away on the sea. With the cragginess of its valleys and peaks distinctly in sight, it lies on its side in the sea, thirty-odd *li* from east to west. Light mists of early fall not rising yet, and the waves not high, I feel as if I could touch it with my hands as I look at it. On the island great quantities of gold well up and in that regard it's a most auspicious island. But from past to present as a place of exile for felons and traitors, it has become a distressing name."

The island of Sado, lying off the eastern coast of central Honshu in the Sea of Japan, was used until the 17th century as a place of exile for political dissidents. At the beginning of the 17th century, gold was discovered in the Aikawa area. The scenes of town streets pictured in the scrolls are those of Aikawa, which had become a boom town, its population at one time approaching 200,000. Although the mines are now virtually exhausted, some gold is still being extracted.

This detailed set of two scrolls of mining and processing is almost identical to sets owned by the Local History Archives of the Ministry of Education in Japan and the Spencer Collection at the New York City Public Library.

Fukusa (Gift Cover)
Edo period, 18th century
Silk
H. 35 × W. 37.5 in.
Cat. 255749, Neg. 110828

Fukusa are lined pieces of fabric that can range in size from about one foot to a yard or more square. They are simply laid over a gift, not wrapped around it like a *furoshiki*. This custom developed in the early 18th century and was practiced by an exclusive minority.

The designs were subtle and often had religious or literary references. Consequently, they were only understood by members of the educated classes. The custom of using ornamental *fukusa* to cover a gift was established in and around large urban centers such as Edo (present-day Tokyo) and Kyoto where the wealthy ruling class was concentrated. The richness of the decoration attested to the wealth of the giver, while the design, selected to suit the occasion, reflected one's cultural sensibility.

This elegant *fukusa* has been dyed, handpainted, and embroidered with bamboo, pine, plum blossoms, tortoise, and crane and enriched with gold thread. It may have been used at New Year's or to help celebrate some other event of special significance to the recipient.

Three Sake Containers
Left: Bottle in shape of "Hotei," Kyoto ware 255483
Edo period, 18th century, H. 8 in.
Center: Bottle in "Hasami" style 255539
Edo period, 18-19th century, H. 10 in.
Right: Hexagonal pot, Imari ware 255473
Edo period, 18th century, H. 6.5 in.
Neg. 110826

Sake, rice wine, has been produced in Japan since ancient times. However, viewed as more than just an alcoholic beverage, producing a pleasant state of intoxication, it has many social, ceremonial, and ritual functions. These functions have resulted not only in an intricate etiquette governing its use, but in the production of vessels of great beauty in a variety of materials. Since *sake* is properly served hot or heated to just below the boiling point, *sake* containers are most commonly made of porcelain or pottery, a material able to withstand heat. Here are three different porcelain containers: one in a more traditional bottle shape with an underglaze floral design in the "Hasami" style; a second, somewhat whimsical container with overglaze enamels and gold in the shape of the mythological figure Hotei, probably from the Kyoto area; and a third, shaped more like a teapot but hexagonal in shape, with overglaze enamels, from the Imari kilns.

Tea Ceremony Kettle
Edo period, early 17th century
Gold on copper
H. 10 in., Diam. 9.5 in.
Cat. 255514, Neg. 110822

Cha no yu (tea ceremony using powdered tea) became popularized in the Edo period (1615-1867), due to the patronage of political and military leaders of the late 15th and early 16th centuries. Shogun Ashikaga Yoshimasa and the warlord Toyotomi Hideyoshi used tea masters, who dictated much of the art of tea ceremony. The display of tea implements became part of the ritualization of *cha no yu* and promoted a desire to acquire beautiful interesting objects. Hideyoshi was known for his collection and would often present an article from it as a token of gratitude to a favored general or loyal samurai retainer.

This handsome teakettle bears the *kiri no mon* (paulownia crest), which suggests that it was in the possession of the Toyotomi family. The *mon* is positioned on an overall ground of a scrolling vine motif. In design as well as workmanship this piece exemplifies the highest quality of the metal craft.

Bowl with Cover
Design of Dutch Figures
Edo period, ca. 1800
Imari ware
H. 3.5 in., Diam. 5 in.
Cat. 255190, Neg. 110823

Porcelain was first produced in the early 17th century in the Arita district of Hizen province (present-day Saga prefecture) in Kyushu. In time a great number of kilns flourished there, and the Arita district became the center for Imari ware ("Arita") as well as Kakeimon and Nabeshima wares. The Dutch were the only foreigners besides the Chinese who were allowed to stay in Japan after 1637, and although confined to the island of Dejima in Nagasaki harbor, they managed for over a century to carry on trade with the Japanese. They ordered large quantities of porcelain, which was shipped by Japanese traders through the port of Imari, 25 miles north of Arita, and brought down by water to Dejima for export to the West. The Japanese, fascinated by the foreigners, depicted the Dutch merchantmen and their black ships on their wares, as is seen on this covered porcelain rice bowl. It was produced at an Imari kiln and is executed in underglaze blue with overglaze enamels and gold.

Hina Dolls
Edo period, early 19th century
Cardboard and padded silk
8.5 × 5.5 in.
Cat. 255441, Neg. 110827

As early as the 10th century, dolls called *hina ningyō* were used by members of the aristocracy, who regarded them not as playthings but rather as substitutes for human beings to which defilements and evil spirits could be transferred. Offerings were made to these dolls, which were set adrift in a river or the ocean. How or when a transformation occurred is not clear, but customs of this nature gradually evolved into the Girls' Festival, held on the third day of the third lunar month to pray for the happiness and growth to maturation of female children. By the Edo period (1615-1867) the celebration was also held at the time of a young woman's marriage and, as a part of the accouterments of Girls' Day, a set of 15 dolls in full court dress with miniature household furnishings was displayed. The emperor and empress from the Boone set of 15 dolls are elegant and unusual two-dimensional figures—more like paper dolls. The body is cardboard covered with a luxurious padded silk costume. It must have been very difficult for little girls not to play with these lovely miniature dolls.

Sumitsubo (Carpenter's Snapline)
Edo period (1615-1867)
Wood
L. 4-10 in.
Cat. 255446-255450, 255460, 255461, Neg. 110831

Sumitsubo ("ink well") is a wooden tool consisting of a wheel with a long line of string or cord and a bowl for ink. It is used by Japanese carpenters in much the same way as western carpenters use a chalkline (snapline). The string comes off the wheel, passes through the ink-soaked flax through a small hole at the end of the frame, then is pulled taut and snapped to mark a straight line for sawing or alignment of materials.

The Boone collection has a small group of *sumitsubo* in various sizes. Each one has a rustic but distinctive design which might qualify the tool as a work of folk art.

Printed Books

Left: *Yamato jimbutsu gafu* ("Album of Japanese Figures")
By Yamaguchi Soken (1759-1818)
2 Vols., 1804
H. 10 in., W. 7 in.
Cat. 223094, Neg. 110829

Right: *Kachō gafu* ("Album of Birds and Flowers")
By Watanabe Seitei (1851-1918)
1903
H. 10 in., W. 6.75 in.
Cat. 223057

Early Japanese books were printed entirely from woodblocks. Printing was done on a highly absorbent paper on one side only, then folded to form pages and were bound. Although Korean and European movable type was known and used at the beginning of the 17th century, woodblock printing continued to be the preferred method throughout the Edo period (1615-1867), during which books were first printed for mass distribution, and remained in general use until the Meiji period (1868-1912).

The two books shown here are both artists' albums, published about a century apart. One is done strictly in ink and the other with color printing. Yamaguchi Soken's album of figures have the immediate appeal and feeling of intimacy that lively and seemingly artless brush sketches give. With humor and wit he allows us a peek into various scenes of everyday life. Different in tone is the album by Watanabe Seitei, one of the most refined of the Meiji bird and flower painters. His study of European art led him toward a tendency to express natural forms in fragile, reticent lines and colors in delicate nuances. These characteristics, while seeming to deny the woodcut medium, are exquisitely captured.

Tansu (Small Chest)
Meiji period, (1868-1912)
Wood with iron fittings
H. 13 in., W. 14 in., D. 10.5 in.
Cat. 255367, Neg. 110825

The most readily recognizable form of traditional Japanese furniture for Westerners is the *tansu*, a chest of drawers with metal fittings. Long admired by collectors for their simplicity, beauty of design, craftsmanship, and functional value, they are made in varying sizes and shapes, and fashioned of costly woods. *Tansu* have been used since the 17th century in homes, shops, and ships to hold personal belongings, merchandise, and valuables. This small chest appears to be one used in the home for personal belongings, with the larger bottom drawer and side door provided with locks; it is elaborately decorated with metalwork of a peony motif.

TWENTY YEARS OF VOLUNTEERS

by Ellen Zebrun
Volunteer Coordinator

1988 marks the twentieth anniversary for the volunteer program at Field Museum. Beginning in 1968 with approximately 30 volunteers, there are now close to 300 who serve in a great variety of ways throughout the Museum. Many departments have volunteers, including the scientific and administrative areas as well as the public areas such as the Education Department and Membership. Volunteers catalog, label, prepare specimens, do research, edit, type, file, prepare charts, maps, and scientific illustrations, care for plants, and translate. They also lead school tours, give programs to the public, and assist with special events.

On Thursday, April 21, Field Museum celebrated the twentieth year of the volunteer program; at the same time it honored its 1987 volunteers with a buffet supper held in Stanley Field Hall. Pastel decorations and spring flowers created a festive, relaxed atmosphere where volunteers and their guests were able to visit with staff members away from the labs, offices, and exhibit halls.

As volunteer coordinator, it was my pleasure to welcome the volunteers and to speak of my own pride in being associated with the volunteer program. It has been a matter of great personal satisfaction to see how the teamwork of volunteers and supervisors has contributed so much to Field Museum's being recognized as one of the great natural history museums in the world.

Robert A. Pritzker, chairman of the Board, thanked the volunteers for their dedication and observed that the volunteers are essential to the Museum's operation. Mr. Pritzker also congratulated the volunteers on the program's twentieth year, which "makes quite a landmark."

During the presentation of awards, Willard L. Boyd, president of Field Museum, expressed appreciation for the volunteers' contributions last year, saying "You make this Museum possible; on behalf of the many publics served, I want to thank you all especially." In 1987, 281 volunteers gave a total of 41,391 hours of service, which is the equivalent of 23.7 additional full-time paid staff members. Commenting that the volunteers' commitment is enduring, Mr. Boyd presented twenty-year service awards of appreciation to Ellen Hyndman, Dorothy Karall, and Anne Ross. Twenty-year volunteer Stan Dvorak, who was unable to attend the ceremony, also received the award. The awards were engraved crystal boxes from Tiffany's and endowed by William L. Searle, a trustee of the Museum. Mr. Boyd urged the other volunteers to stay for twenty years so that they, too, could receive this special honor. He then gave special recognition to the eight volunteers with 500 or more hours of service in 1987.

Volunteers with 20 or More Years of Service

Stan Dvorak

Although the volunteer program at Field Museum began officially in 1968, Stan Dvorak has been involved with the Invertebrate Division of the Zoology Department since 1953, when he began to help process two million marine shells that had been acquired for the collection during the previous ten years. Stan helped to identify material, offered specimens to add to the collection, and advised staff on purchasing new specimens. Stan has also worked in a similar manner on our collections of freshwater clams from local lakes and streams, and also on the Florida tree snails collection. In the past year, Stan also began volunteering in the Geology Department, assisting with the Schrammen fossil sponge collection acquired from Princeton University and with the Mazon Creek invertebrate fossil collection.

Ellen Hyndman

During her first three years of volunteer service, Ellen was in the Anthropology Department. Under the supervision of Conservator Christine Danziger, Ellen worked in the textile conservation lab preparing and restoring rare Tibetan textiles. Ellen then moved to the Education Department, providing educational hall programs to visiting school groups. As the department's

Field Museum president Willard L. Boyd presents 20-year awards to volunteers Anne Ross (above, left), Dorothy Karall (above), and Ellen Hyndman. Twenty-year volunteer Stan Dvorak, who has also received the award, was unable to attend the ceremony. The awards were engraved crystal boxes from Tiffany's and were endowed by trustee William L. Searle. Photos by RonTesta 85088 23, 85088.22, 858088 21

school programming expanded, so did Ellen's repertoire of hall programs, covering the four areas of natural history. In 1983, Ellen transferred for two years to the Geology Department, where she worked with Collection Manager Clay Bruner on cataloging fossil teeth and researching references for scientific papers. In 1985, Ellen returned to the Education Department, where she is again sharing information with school groups.

Dorothy Karall

Dorothy began her association with Field Museum in 1965; just like Stan Dvorak, Dorothy was here before records were kept on the volunteer program. For the past 22 years, Dorothy has been a volunteer in the Invertebrate Division of the Zoology Department. As a volunteer, Dorothy has readied a wide variety of materials for publication—drawings, maps, charts, photographs, and scientific illustrations. Her duties include mounting and labelling these materials to be published. There have been approximately 100 research papers, some of which are book-length, which Dorothy has helped prepare for the publishers since 1965 and has thus extended the reputation of this institution internationally.

Anne Ross

Although for a time Anne led a double life at Field Museum — volunteering in both the Zoology and Education Departments—most of her twenty years of service has been in the Education Department. Anne was one of the first volunteers to give educational programs to school groups. She, like Ellen Hyndman, trained for a wide variety of hall tours, adding new programs as the number of tours offered to visiting school groups grew. Since she is trained in eighteen separate programs, on a typical day Anne can switch from "Dinosaurs" to "Ancient Egypt" to "Animal Habitats," depending on what the particular school group has requested. A few years back, Anne reorganized the reprint library for the Amphibians and Reptiles Division of Zoology.

Volunteers with 500 or More Hours in 1987

Sophie Anne Brunner	for *Amphibians and Reptiles:* Hymen Marx, supervisor
Ingrid Fauci	for *Amphibians and Reptiles:* Hymen Marx, supervisor
Lillian Kreitman	for *Membership:* Gregory K. Porter, supervisor
John Phelps, Jr.	for *Mammals:* Greg Guliuzza, supervisor
William Roder	for *Tours:* Dorothy Roder, supervisor
Bruce Saipe	for *Public Relations:* Sherry DeVries and Lisa Elkuss, supervisors
Llois Stein	for *Anthropology:* Phillip Lewis, supervisor
Edward Yastrow	for *Anthropology:* Glen Cole, supervisor

400 or More Hours

Sol Century	for *Anthropology:* Bennet Bronson, supervisor
Rosemary Kalin	for *Education:* Mary Ann Bloom and Ingrid Melief, supervisors
Margaret Martling	for *Botany:* William Burger, supervisor
Sam Mayo	for *Public Programs:* Phyllis Rabineau, supervisor
Mary Nelson	for *Anthropology:* Glen Cole, supervisor; *Education:* Mary Ann Bloom and Ingrid Melief, supervisors
Gary Ossewaarde	for *Education:* Marcia MacRae, supervisor
Stephen Robinet	for *Insects:* Steve Ashe and Daniel Summers, supervisors; *Mammals:* Greg Guliuzza, supervisor

300 Hours or More

Dennis Bara	for *Membership:* Gregory K. Porter, supervisor
Robert Gowland	for *Anthropology:* Christine Gross, supervisor
Deborah Green	for *Anthropology:* Glen Cole, supervisor
Melba Mayo	for *Education:* Philip Hanson, supervisor
John Nelson	for *Education:* Mary Ann Bloom and Ingrid Melief, supervisors
Worthington Smith	for *Library:* Benjamin Williams, supervisor
Maxine Walter	for *Zoology:* Anita Del Genio, supervisor
Sims Wayt	for *Anthropology:* Robert Welsch, supervisor

Volunteers with 50 or More Hours

Neal Abarbanell
Lisa Adler
Paul Adler
Dee Arbanas
Joyce Altman
Jackie Arnold
Terry Asher
Margaret Axelrod
Beverly Baxter
Paul Baker
Jean Baldwin-Herbert
Dennis Bara
Lucia Barba
Nancy Barco
Gwen Barnett
Dodie Baumgarten
Barbara Beardsley
Carol Benzing
Larry Berman
Elaine Bernstein
Frieda Bernstein
Jennifer Blitz
Fran Braverman
Carol Briscoe
Carolyn Brna
Irene Broede
Garland Brown
Sophie Ann Brunner
Brenda Buckley-Kuhn
James Burd
Joseph Cablk
Rick Capitulo
Robert Cary
Colleen Casey
Linda Celesia
Sol Century
Irene Chong
Byron Collins
James Coplan
Artemis Cosentino
John Cox
Connie Crane
Ellie De Koven
Jeannette DeLaney
Violet Diacou
Patricia Dodson
*Clarice Dorner

Millie Drower
Stan Dvorak
Reginald Echols
Linda Egebrecht
Anne Ekman
Elizabeth Enck
Bonnie Engel
Lena Fagnani
Elisabeth Farwell
Ingrid Fauci
Joseph Fisher
Amy Franke
Arden Frederick
Carlene Friedman
Debra Jean Frels
Alta Mae Frobish
Kirk Frye
Mimi Futransky
Barbara Gardner
Bernice Gardner
Peter Gayford
Pat Georgouses
Phyllis Ginardi
Delores Glasbrenner
Tom Gnoske
Halina Goldsmith
Evelyn Gottlieb
Robert Gowland
Vladimir Grabas
Deborah Green
Loretta Green
Frank Greene, Jr.
Henry Greenwald
Ann Grimes
Yvonne Haen
Dennis Hall
Meg Halsey-Perez
Kristine Hammerstrand
Anna Hammond
Judith Hannah
Nancy Harlan
Curtis Harrell
Mattie Harris
Shirley Hattis
Audrey Hiller
Clarissa Hinton
Tina Fung Holder
Harold Honor
Zelda Honor

Scott Houtteman
Ruth Howard
Ellen Hyndman
Connie Jacobs
Sheila James
Bette Jarz
Cynthia Johnson
Mabel Johnson
Malcom Jones
Carol Kacin
Rosemary Kalin
Dorothy Karall
Susan Kennedy
Dennis Kinzig
Alida Klaud
Susan Knoll
Lillian Kreitman
Gretchen Kubasiak
Sally Kurth
Carol Landow
Michelle Lazar
Sandra Lee
Frank Leslie
Jane Levin
Joseph Levin
Ruth Lew
Betty Lewis
Valerie Lewis
Victor Lieberman
Tory Light
Catherine Lindroth
Mary Jo Lucas-Healy
Stella Maquiraya
Gabby Margo
Phyllis Marta
Jeanne Martineau
Margaret Martling
Cliff Massoth
M. Dulce Matanguihan
Britta Mather
Sel Mather
David Matusik
Marita Maxey
Melba Mayo
Sam Mayo
Louise McEachran
Withrow Meeker
Beverly Meyer
Sandra Milne

Barbara Milott
Larry Misialek
Sharon Mitchiner
Carolyn Moore
Gail Munden
George Murray
Carolyn Mylander
John Nelson
Mary Nelson
Louise Neuert
Natalie Newberger
Donald Newton
Ernest Newton
Herta Newton
Virginia Newton
Doris Nitecki
Connie Noel
Josie Nyirenda
Dennis O'Donnell
Dorothy Oliver
Joan Opila
Gary Ossewaarde
China Oughton
Marcella Owens
Anita Padnos
Susan Parker
Phil Parrillo
Martha Pedroza
John Phelps
Dorothea Phipps-Cruz
Jackie Prine
Naomi Pruchnik
Elizabeth Rada
Julie Realmuto
Ernest Reed
Daniel Reilly
Sheila Reynolds
Elly Ripp
Steve Robinet
Earl Robinson
Nancy Robinson
Pam Robinson
William Roder
Barbara Roob
Susan Roop
Sharon Rose
Sarah Rosenbloom
Anne Ross

Ann Rubeck
Lenore Ruehr
Gladys Ruzich
Bruce Saipe
Joseph Salzer
Lucile Salzer
Terry Sanders
Marian Saska
Everett Schellpfeffer
Marianne Schenker
Carol Schneider
Florence Selko
Patricia Sershon
Adam Seward
Danny Shelton
Judith Sherry
Lisa Shogren
Sharon Simmons
James Skorcz
Worthington Smith
Daniel Snydacker
Beth Spencer
Carrie Stahl
Llois Stein
Frances Stromquist
Ruby Suzuki
Beatrice Swartchild
Dana Temple
Jane Thain
Patricia Thomas
Kathleen North Tomczyk
Karen Urnezis
Lillian Vanek
Jeffrey Vaughn
Barbara Vear
David Walker
Cassandra Walsh
Maxine Walter
Sims Wayt
Dorothea Wechselberger
Mary Wenzel
Fred Werner
Claudia Whitaker
Reeva Wolfson
Zinette Yacker
Edward Yastrow
Laura Zaidenberg
Ben Zajac

*Deceased

"Ramesses The Great" Tour

Saturday, July 2 to Tuesday, July 5
Boston Museum of Science

FIELD MUSEUM TOURS

THE EXHIBITION OF RAMESSES THE GREAT, on loan from Cairo's world-famous Egyptian Museum, is the largest assemblage of Egypt's national treasures to ever visit the United States (artifacts outnumber the Tutankhamun exhibition). The exhibit will be shown at the Boston Museum of Science April 30 through August 30, 1988. We invite you to take advantage of the opportunity to see this spectacular exhibit while it is in our country, and to celebrate the Fourth of July in Boston at *Harborfest '87.* The schedule of special events for this five-day festival is extensive, with many of the activities being free. A highlight will be the Boston Pops concert on the Esplanade, and the Fourth of July fireworks display.

Our Itinerary:

Saturday July 2 Depart Chicago O'Hare airport on United Airlines breakfast flight #684 at 8:30 a.m. Flight is nonstop to Boston Logan Airport. Upon arrival at 11:45 we'll be met by our guide, and we'll enjoy a tour of some of Boston's highlights by deluxe motorcoach. (Your luggage will be taken directly to the Park Plaza Hotel.) Mid-afternoon we'll check into the Park Plaza Hotel for a period of relaxation before dinner. This evening we board "The Spirit of Boston" for a harbor dinner cruise, which will include festive entertainment and dancing.

Sunday July 3 Day at leisure to give you the opportunity to enjoy some of the special events of Harborfest. This evening we'll go to the Museum of Science to tour the Ramesses exhibit with Del Nord, Egyptologist, as our guide. Many of you will remember Ms. Nord from the Tutankhamun era at Field Museum. She led many Egypt tours from 1976 to 1984 for Field Museum/ Oriental Institute. According to a number of tour members, Del is a professional of the highest calibre, and an asset to Egyptology. She truly loves Egypt and the history and culture of this fabulous land. Dinner on your own. There is a choice of three restaurants in the Museum.

Monday July 4 This morning we'll take a motorcoach tour to Cambridge, Lexington, and Concord, including stops at several historic sites, one being the "Old Manse" home of author Nathaniel Hawthorne. We'll enjoy lunch at the historic Colonial Inn, built in 1772. The afternoon will be at leisure. The highlight of the evening will be the famous Boston Pops esplanade concert, with a box dinner provided.

Tuesday July 5 We'll depart Logan Airport on United Airlines flight #393 at 9:30 a.m., flying nonstop to Chicago O'Hare and arriving at 11:15 a.m.

We hope you will join Field Museum's tour group for this trip to Boston. The cost is $895.00 per person (double occupancy), single supplement $330.00. Early reservations will ensure your enrollment at this price, which is based on 30-day advance purchase of air tickets. A deposit of $200.00 per person, payable to Field Museum Tours, will hold space in the order reservations are received. Our group will be limited to 30 participants. For further information please call 322-8862.

Spaces still available for . . .

Voyage to The Gulf of St. Lawrence and Canada's Maritime Provinces

Aboard the *Illiria*
July 1-9, 1988
Accompanied by Dr. David Willard, Field Museum Zoologist

For reservations, call or write Dorothy Roder (322-8862), Tours Manager, Field Museum, Roosevelt Rd. at Lake Shore Dr., Chicago, Il 60605

Field Museum of Natural History
Membership Department
Roosevelt Road at Lake Shore Drive
Chicago, IL 60605-2499

MISS MARITA MAXEY
7411 NORTH GREENVIEW
CHICAGO IL 60626

FIELD MUSEUM OF NATURAL HISTORY BULLETIN

July/August 1988

World Music Programs

Weekends in July and August

See "Events" section

Field Museum of Natural History Bulletin

Published since 1930 by
Field Museum of Natural History
Founded 1893

Editor/Designer: David M. Walsten
Production Liaison: Pamela Stearns
Staff Photographer: Ron Testa

BOARD OF TRUSTEES

Robert A. Pritzker
Chairman
Mrs. T. Stanton Armour
George R. Baker
Robert O. Bass
Gordon Bent
Mrs. Philip D. Block III
Willard L. Boyd,
President
Robert D. Cadieux
Worley H. Clark
James W. Compton
Frank W. Considine
William R. Dickinson, Jr.
Thomas E. Donnelley II
Thomas J. Eyerman
Marshall Field
Ronald J. Gidwitz
Clarence E. Johnson
Richard M. Jones
John James Kinsella
Robert D. Kolar
Hugo J. Melvoin
Leo F. Mullin
James J. O'Connor
Mrs. James J. O'Connor
James H. Ransom
John S. Runnells
Patrick G. Ryan
William L. Searle
Robert H. Strotz
Mrs. Theodore D. Tieken
E. Leland Webber
Blaine J. Yarrington

LIFE TRUSTEES

Harry O. Bercher
Bowen Blair
Stanton R. Cook
Mrs. Edwin J. DeCosta
Mrs. David W. Grainger
Clifford C. Gregg
Mrs. Robert S. Hartman
Edward Byron Smith
John W. Sullivan
J. Howard Wood

CONTENTS

July/August 1988
Volume 59, Number 7

JULY and AUGUST EVENTS AT FIELD MUSEUM 3

MEXICAN TEXTILES COME TO FIELD MUSEUM JULY 8 6

MOUNTAINS in the SEA, MOUNTAINS in the SKY
The Field Museum Founders' Council visits the Galapagos Islands, the Ecuador mainland and Peru, gaining insights into the work of the museum curator.
By Valerie Searle Lewis and Louise K. Smith. 8

BEGINNING AS A COLLECTOR
By A. S. Meek. 19

GENSBURG-MARKHAM, a gem of a prairie, saved for future generations.
By Jerry Sullivan 22

FIELD MUSEUM TOURS 31

COVER

The Galapagos giant tortoise can weigh up to 550 pounds and may live more than 100 years. They are vegetarian but can survive for up to a year without food or water. The name Galapagos originates from the Spanish word *galapago* which means "tortoise." This fellow was photographed by Dr. Michael Lewis in the Galapagos during the Founders' Council recent trip to Ecuador. See page 8.

Volunteer at Field Museum

Learn something new or share your expertise—a wide variety of challenging and rewarding volunteer opportunities for either weekdays or weekends are currently available. Please call the Volunteer Coordinator at (312) 922-9410, extension 360, for more information.

Field Museum of Natural History Bulletin (USPS 898-940) is published monthly, except combined July/August issue, by Field Museum of Natural History, Roosevelt Road at Lake Shore Drive, Chicago, IL 60605-2496.

Copyright ©1988 Field Museum of Natural History.

Subscriptions: $6.00 annually. $3.00 for schools. Museum membership includes *Bulletin* subscription. Opinions expressed by authors are their own and do not necessarily reflect the policy of Field Museum. Unsolicited manuscripts are welcome. Museum phone: (312) 922-9410. Notification of address change should include address label and be sent to Membership Department. Postmaster: Please send form 3579 to Field Museum of Natural History, Roosevelt Road at Lake Shore Drive, Chicago, IL 60605-2496. ISSN: 0015-0703. Second class postage paid at Chicago, Illinois and additional mailing office.

EVENTS

After Hours
Films at the Field

FREE!

Fridays in July
No film Friday, July 1

After Hours Cafe opens at 4:30pm
Films begin at 6:00pm

Field Museum continues its program of free contemporary feature films from around the world. Friday evenings in July highlight films from Africa.

After Hours Cafe opens at 4:30pm serving light fare and beverages. Films begin at 6:00pm. Be sure to use the West Entrance. For more information call (312) 322-8855.

AFRICAN FILMS

☐ July 8

"Kukurantumi: The Road to Accra"
1983. 86 minutes. Color. Ghana. Director: King Ampaw. English subtitles.

When an African lorry driver loses his job, he decides to get his own bus: a decision that begins the gradual chipping away of a traditional lifestyle he once knew.

"Camara d'Afrique: 20 Years of African Cinema"
1983. 85 minutes. Color. Tunisia. Director: Ferid Boughedir. Documentary. French with English subtitles.

This anthology surveys filmmaking in Africa and includes interviews with African filmmakers on the various dimensions of their craft.

☐ July 15

"Harvest 3000"
1976. 138 minutes. Black and White. Ethiopia. Director: Haile Gerima. Amharic with English subtitles.

The tragic story of an Ethiopian peasant family in the 1970s who must live under the feudal domain of a wealthy landowner.

"Lorang's Way"
1978. 66 minutes. Color. Kenya. Director: David and Judith MacDougall. Ethnographic. Turkana with English subtitles.

This classic ethnographic film profiles a wise elder of the Turkana people, who has come to see his society as vulnerable in the changing world around it.

☐ July 22

Ceddo
1977. 120 minutes. Color. Senegal. Director: Ousmane Sembene. Wolof with English subtitles.

Sembene's classic epic chronicles the events of the struggle for power between colonialists and Senegalese nobility as Islam spreads through Senegal in the 19th century.

Wend Kuuni
1982. 75 minutes. Color. Burkina Faso. Gaston Kobore. English subtitles.

Told in the style similar to the African griot, this is the tale of a mute boy who is found and renamed "Wend Kuuni" ("God's Gift") by his new family.

☐ July 29

Xala
1977. 123 minutes. Color. Senegal. Director: Ousmane Sembene. Wolof with English subtitles.

In this satire of modern Africa, a politician, determined to possess a third wife, is struck down by "xala," a curse rendering him impotent.

Borom Sarret
1963. 20 minutes. Black and White. Director: Ousmane Sembene. French with English subtitles.

A pointed, poignant view of the struggle for existence in the streets of Dakar, Senegal's capital.

Continued ▷

EVENTS

World Music Programs

Weekends in July
1:00pm and 3:00pm

Program highlights include:

☐ *July 2*—1:00pm and 3:00pm: Fan Wei-tsu—*zheng*, the Chinese zither

☐ *July 9, 10*—1:00pm: Eli Hoenai—African percussion; 3:00pm: Rita Warford—vocals

☐ *July 16, 17*—1:00pm: Shanta—African folktales; 3:00pm: Brenda Jones—vocals

☐ *July 23, 24*—1:00pm: Douglas Ewart—Shakuhachi flute; 3:00pm: Kwasi Adounum—Ghanan percussion

Weekends in August
1:00pm and 3:00pm

Program highlights include:

☐ *August 6, 7*—1:00pm: Shanta—African folktales

☐ *August 13, 14*—1:00pm: Douglas Ewart—Shakuhachi flute

☐ *August 20, 21*—1:00pm and 3:00pm: Don Pate—bass

☐ *August 27, 28*—1:00pm: Brenda Jones—vocals and reed instruments; 3:00pm: Kwasi Adounum—Ghanan percussion

The World Music Program is supported by the Kenneth and Harle Montgomery Fund and a City Arts IV grant from the Chicago Office of Fine Arts, Department of Cultural Affairs.

Summer Fun 1988

Summer workshops for 4-13-year-olds continue in July. Workshop topics as diverse as Field Museum's collections are offered Wednesday through Sunday until July 31. Advance registration is required. For a descriptive brochure and class availability call (312) 332-8854.

Weekend Programs

EACH SATURDAY AND SUNDAY YOU ARE INVITED to explore the world of natural history at Field Museum. Free tours, demonstrations, and films related to ongoing exhibits at the Museum are designed for families and adults. Listed below are a few of the numerous activities each weekend. Check the activity listing upon arrival for the complete schedule and program locations. The programs are partially supported by a grant from the Illinois Arts Council.

July

3 2:00pm. *Malvina Hoffman* (slide lecture)

30 1:30pm. *Tibet Today and Bhutan* (slide lecture)

August

6 1:30pm. *Tibet Today* (slide lecture and tour of collection)

27 1:30pm. *Tibet Today and a Faith in Exile* (slide lecture)

Hall Interpreters Program

Thursday through Sunday
July and August

THE "DOG DAYS" OF SUMMER are a great time to learn a few new tricks at Field Museum. In exciting hands-on programs, you make Egyptian papyrus paper, heft the ingenious drills and adzes of Native America, and play with the Chinese seven-piece puzzles that Lewis Carroll loved.

Hall interpreters, dressed in blue aprons and located throughout the exhibits, help you and your friends experience the wonders of the world. Cool off with the hottest new theories about dinosaur extinction. Learn to weave without a loom, and see just what earthworms are up to under your lawn this summer.

These exciting programs, partially sponsored by the Joyce Foundation and the Lloyd A. Fry Foundation, are available to all Museum visitors Thursday through Sunday. Please consult the TV monitors throughout the Museum for activity locations.

TRADITIONS IN JAPANESE ART:

The Boone Collection

closes October 2

Hina Dolls
Edo period, early 19th century
Cardboard and padded silk
8.5 × 5.5 in.
Cat. 255441, Neg. 110827

Mexican Textiles: Color, Texture, Tradition

July 8 through September 5

FIELD MUSEUM WILL OFFER an unusual, brilliantly hued exhibit titled "*Mexican Textiles: Color, Texture, Tradition,*" on July 8, continuing through September 5. This stunning assemblage of 125 textile pieces reveals how Mexican weavers, mostly Indian women, have turned traditional work into artistic expression. Items on display include *huipiles* (blouse-like garments), *sarapes* and *rebozos* (shawls), *quexquemitls* (shoulder coverings), wraparound skirts, sashes, shoulder bags, and tortilla cloths.

The exhibit is organized and guest-curated by cultural anthropologist Jill Vexler, Ph.D., whose studies and extensive museum work have focused strongly on Latin American countries. "Traditionally, museums have exhibited Mexican textiles as cultural expressions, stressing anthropology rather than art," says Vexler. "Mexico has some 86 indigenous cultures with individual customs, lifestyles, and languages. The textiles and garments produced by each group are distinct, bearing social, economic, and idealogical implications. While the exhibit at Field Museum is naturally concerned with cultural significance, it also emphasizes aesthetics. Through this exhibit I've discovered that the aesthetic approach, coupled with cultural information, opens visitors' eyes to the diverse peoples who create these beautiful textiles."

Elements such as color, design, technique, and cut of traditional Mexican garments, identify the villages where they were created. An individual's language and lifestyle can often be determined by the clothing he or she wears. By highlighting the beauty of Mexican textiles, this exhibit demonstrates how artistic expression can transcend the hardships common to life in remote villages.

Featured items in the exhibit include a colorful *quexquemitl* made by the Totanic Indians in the village of Pantepc, Puebla. A *quexquemitl* is a pre-Hispanic, triangular garment for women, worn cape-like around the shoulders. It incorporates brocade, intricate embroidery, needlework, and curved weaving—a complicated form of loom weaving. The exhibit includes a wedding *huipil*, a blouse-like garment based on very ancient brocade design. Light feathers woven into the velvet-like brocade distinguish this garment, made in the village of Zinacantan, Chiapas.

Festival wraparound skirts, also featured, are still worn in the village of Citlala, Guerrero. Each skirt consists of a three-foot-wide, twelve-foot-long piece of fabric that drapes many times around the body. These unusual skirts are embroidered with synthetic silk and sparkling sequins in bird and floral motifs. In addition to garments, the exhibit also displays shoulder bags and tortilla cloths. Tortilla cloths are found in every Mexican home and can range from simple coverings to those of elaborately decorated silk.

Field Museum is hosting "*Mexican Textiles: Color, Texture, Tradition*" in conjunction with "Convergence '88," the national convention of the Weavers' Guild of America. The convention will be held in Chicago July 8 through 10. "*Mexican Textiles: Line, Color, Tradition*" is free with regular Museum admission.

Mazatec woman's *huipil*, a type of blouse (detail). Cotton embroidery on cotton ground. From Ayautla, Oaxaca, Mexico. Collection of Luz Elena Cervantes, collected in the 1960s. Photo by E. Ladrón de Guevara.

MOUNTAINS in the SEA, MOUNTAINS in the SKY

Field Museum's Founders' Council members see natural science firsthand and gain insights into the field research of Museum curators

by Valerie Searle Lewis
and Louise K. Smith

photography by Jean K. Carton
and Dr. Michael S. Lewis

FIELD MUSEUM FOUNDERS' COUNCIL exists to support the many facets of the Museum, particularly collections and scientific research. Thus, in March this year, when Ecuador and Peru became peerless outdoor classrooms, members of the Council were able to see firsthand how vital is that research. Lectures, seminars, and instruction in the field, as well as accounts of current research projects, deepened the group's natural science and archaeological knowledge. In Ecuador our tutor was Dr. John Fitzpatrick, chairman of the Department of Zoology and curator of Birds. In Peru we benefited from the scholarship of Dr. Charles Stanish, assistant curator of Middle and South American Archaeology and Ethnology.

Charles Darwin on HMS *Beagle* came upon the magical world of the Galapagos Islands slowly and peacefully, under sail. Today's travelers fly in by jet. But once on board the cruise ship, which was to be home and classroom for the next eight days, our group was soon overtaken by the utter tranquillity of what Darwin called these "enchanted islands."

In the Pacific Ocean 600 miles off the coast of Ecuador and right on the equator, the archipelago consists of about 13 major islands and many smaller ones. In 1959 the Ecuadorian government established the area as a national park. Today, the park administration and its wardens, aided by stringent rules governing tourism, are attempting to rectify the disastrous depredations wrought by man and to conserve this fragile ecosystem.

Geologically the Galapagos are young. A mere four to five million years old, they are the peaks of volcanoes which have built up vast accumulations of lava

---

Valerie Searle Lewis, Louise K. Smith, Jean K. Carton, and Dr. Michael S. Lewis are members of the Field Museum Founders' Council.

Our cruise ship is anchored near Bartolome Island. To the left is an eroded tuff cone, known as a pinnacle rock, and in the background, several cones of cinder and lava. Michael Lewis

from the floor of the ocean. The westernmost islands are the most recently formed and still have a number of active volcanoes. To the visitor the lava on several of the islands seems like black mud which has just set hard after flowing in sticky swirls and folds. Plant life is often only just beginning to take hold. Huge calderas, or collapsed craters, are to be seen. Some islands have beaches of red or black lava. Bartolome Island offered a lunar-like landscape in every direction: cones of all sizes, frozen lava rivers, lava tunnels, jagged rocks, and almost no vegetation. In this silent, rugged landscape a solitary Galapagos hawk and a small lava lizard were the only signs of life.

Darwin's theory of evolution and subsequent, supplementary theories were elucidated for us by Dr. Fitzpatrick, our superb guide and teacher. Darwin pos-

Land iguanas, yellowish orange and reddish brown, feed mainly on prickly pear cactus. They grow to more than three feet in length and may live more than sixty years. Michael Lewis

Marine iguanas, the world's only seagoing lizard, sun themselves by the shore. From salt glands connected to their nostrils, they excrete salt which becomes encrusted on their heads. Their claws are sharp for clinging to rocks. Michael Lewis

tulated that organisms change over many generations in adaptation to new or changing environments. This conclusion was based in part on his famous observation that Galapagos finches became different species as a result of adapting to the distinct conditions of separate islands. Thus, from a single common ancestor evolved a seed-crushing large ground finch, an insectivorous warbler finch, a tool-using finch, and a leaf-eating vegetarian finch, each with its beak adapted to its specialized feeding habits.

The famed Galapagos giant tortoises also played an important part in the development of Darwin's theory of evolution. On islands where the vegetation is sparse and high off the ground, tortoises of the saddle-backed type, with a carapace that is raised in front, are able to stretch their necks to reach food. On islands with lusher vegetation, those of the dome-shaped type, with a carapace that is thick in front, are able to push through the dense undergrowth. Visitors now can see these slow-moving, drowsy looking creatures at the Charles Darwin Research Station on Santa Cruz Island. During the past two centuries they were prey to

The male great frigatebird is seen showing off his gular pouch. This is inflated during the mating season to attract females. Michael Lewis

pirates, whalers, and sealers who took them aboard as a meat supply. As many as 200,000 tortoises are estimated to have perished in this way. Today tortoise eggs and hatchlings are food for the wild dogs, pigs, and cats which are the descendants of domesticated animals introduced by sailors and settlers to some islands. Thus, tortoise eggs are brought to the research station by staff who watch over the early growth of the young reptiles. At about five years of age they are released back into the wild. The eggs of other endangered species, such as the land iguanas, are similarly hatched at the research station.

Remarkable creatures such as the marine iguanas have managed to survive by evolving new ways of life in the frequently inhospitable conditions of the islands. These reptiles arrived on rafts of floating vegetation washed out to sea after violent storms on the mainland. Over hundreds of thousands of years they have adapted to the very different life of the archipelago. They are the only sea-going lizards in the world, diving beneath the surface to feed on algae. When they settle back on the rocks they frequently appear to be sneezing, though they are, in fact, excreting excess salt that has been ingested in their high-salt diet. They huddle in groups —small black monsters on black lava rocks, immobile and menacing. When Museum President Sandy Boyd lay down on the rocks to confront them, his eyes only two feet from theirs, they were unmoved, like a brigade of indignant Victorian matrons.

Since it was spring, the air on islands with large bird populations was heavy with passion and ardor. Male great frigatebirds, with their extraordinary scarlet gular sacs puffed up like a soccer ball between bill and breast, sat in the bushes with their enormous wings widespread, fluttering and undulating to attract the females who cruised overhead. From her decidedly su-

Male and female blue footed boobies with chick. One to three eggs are laid on the bare ground and incubated by both parents under their feet. Michael Lewis

Sea lion pups are inquisitive and playful. Ms. Louise Smith seems pleased with the attention. Michael Lewis

sand diminutive Galapagos penguins are evidence of successful adaptation to living on hot land and feeding in the cold waters of the Humboldt Current. The flightless cormorant seems to have developed a more streamlined body for swimming, at the expense of flight. This example of natural selection probably came about because of the close proximity of its feeding grounds and because of the lack of indigenous terrestrial predators. This latter fact is the reason the Galapagos fauna—sea lions in particular—have little fear and

An endearing sea lion pup preparing to nurse from his mother. Female sea lions have a nine-month gestation period and give birth to a single pup, which is suckled from one to three years. Michael Lewis

perior vantage point, the female might eventually select an alluring fellow, fly down beside him and be entranced by his physical and vocal prowess. The elegant swallowtailed gulls were also engaged in much courting and mating. But it was the bluefooted boobies' wooing which was most engaging. We found it hard to take these creatures seriously, with their large, bright blue feet, dancing in ponderous slow-motion as if caught in a puddle of glue. But they, like all other courting birds, were simply showing off their own important assets to one another.

The birds and reptiles of the Galapagos enchant the visitor with their strangeness, their striking appearance, and their closeness to the viewer. Penguins seem very out of place on a tropical island, yet several thou-

do not shy away from humans. These mammals, the largest animals on the islands, would lie like cumbersome mounds on the beaches of many of the islands which we visited, regarding us with large, baleful eyes as we photographed and stared at them from a few feet away. But once in the water they were lithe, graceful, and playful. We watched them body-surfing in the big Pacific waves and could not doubt that they were having fun. One of the most memorable and exciting times of the whole trip was the afternoon we snorkled on James Island. The sea lions wanted to play and made

Above: Masked boobies are the largest and heaviest boobies in the Galapagos Islands. Therefore, they often nest in colonies near cliffs, so that upward air currents make it easier for them to launch themselves in flight. **Below:** Male and female red footed boobies are seen resting in a tree, a most unusual habit for a seabird. They are able to do this because they have prehensile feet. Michael Lewis

this clear by cavorting around us. They would swim so close that we could touch them; before swooping past us they would look right into our eyes with curiosity and, it seemed, a desire to communicate.

Since visitors come to the islands by way of mainland Ecuador, our journey in fact began in Quito, a city which is noteworthy for a number of reasons. At 9,000 feet above sea level it is the third highest capital city in the world and is only fifteen miles from the equator. Set within a bowl in the Andes Mountains, the city boasts views of snowy peaks, including the majestic volcano Cotopaxi. In the old part of the city more colonial buildings remain than in most other South American cities, thus offering picturesque sights of narrow streets and whitewashed buildings with balconies.

From Quito we visited the spectacular Indian market at Otavalo. The women are eye-catching in their white embroidered blouses, navy skirts, and many rows of gilded beads around their necks. The men have striking profiles under homburg hats and a single, long braid down their backs over their ponchos. The market was alive with the colors of their weavings. The vegetables, fruits, and meats added other hues to the spectrum. On the wall of the surrounding buildings were splashed posters and slogans for the forthcoming presidential election in Ecuador.

An exhilarating day of bird watching followed in the Pasachoa Nature Preserve under the skillful guidance of Dr. Fitzpatrick. In this green valley near Quito we were able to see some of Ecuador's immensely rich birdlife while delighting in their equally ornate names: streak-throated bush-tyrant, scarlet-bellied mountain tanager, red-crested cotinga and hummingbirds called sapphire-vented puff-leg, amethyst-throated woodstar, and collared Inca.

When our Field Museum group left Ecuador our comprehension of the major conservation measures undertaken by the Ecuadorian government in the Galapagos National Park was greatly enhanced, as was our sensitivity to the fragility of the environment and the need for its protection in the future. Each one of us certainly will always have an intense appreciation of nature's most spectacular laboratory of evolution—the incalculably valuable treasure that is Galapagos.

—Valerie Searle Lewis

THE TOUR REGROUPED IN LIMA, PERU, the colonial Spanish city built on the Pacific coast of South America in the midst of one of the great temperate deserts of the world. Despite its lack of rain, however, the boulevards bloom from irrigation waters flowing down from the Andes, just to the east. The group was accompanied during this phase of the trip by Field Museum's assistant curator of Middle/South American archaeology and ethnology, Charles "Chip" Stanish, who is in the process of starting a new project, a dig in Peru near the Bolivian border on Lake Titicaca, where he will be continuing his research on the Aymara Indians, closely related to the Incas.

Lima's central square, Plaza de Armas, strongly reflects the city's Spanish heritage. Enormous public buildings, all terra cotta pink with white trim, shelter

active entrepreneurial markets in the promenades under graceful arches. Other old buildings are festooned with magnificent carved mahogany balconies, one of the architectural hallmarks of Lima. These structures, dating from the sixteenth-century Spanish tradition, serve as elaborate window screens which allow the (ventilated) tenant to look out while not being seen. Our visit to Lima was necessarily short, as it was merely a stopover on the way to Cuzco.

An Otavalo Indian woman with gilded necklace and embroidered blouse. Everyone wears some protection on their head, however makeshift, against the strong equatorial sun.
Michael Lewis

Cuzco was for centuries the capital of the Incas, until Francisco Pizarro conquered the Incas and captured the city in 1553. It sits 11,000 feet above sea level in a valley between two spurs of the Andes. (When we arrived at Cuzco we all drank the special tea made from coca leaves to alleviate dizziness from the altitude, and were cautioned to rest for an hour or so.) The Incas were master builders, superb civil engineers and architects, and must have had a bureaucracy which rivalled those at Memphis and Rome. They planned and developed a network of roads and bridges which ran the length of the empire, up and down the Andes. Communication was effected by a system of runners who jogged at a steady pace, despite the altitude, sufficient in numbers and strength to keep the various ends of the empire in touch with each other. Legend has it that the roads and the runners were efficient enough to bring fresh fish from the seashore to the Inca kings in Cuzco.

The city of Cuzco is a curious mixture of Spanish on top of Incan—literally. The ancient narrow cobblestone streets of Cuzco are lined on both sides by walls of the houses of these two cultures. Magnificent huge dark grey boulders, each weighing as much as ten tons, were quarried and then moved to the building site. There, each facing surface was painstakingly ground to abut its four neighbors so exactly that not only was no mortar required but one even now cannot insert a slender blade between them. The walls rise

Founders' Council members who are also members of the Field Museum Women's Board shown in the volcanic landscape near the summit of Bartolome Island. Standing (l. to r.): Mrs. Robert W. Carton, Mrs. Willard L. Boyd, Mrs. Malcolm N. Smith, Mrs. Henry T. Chandler, Mrs. John C. Meeker. Seated: Mrs. Robert D. Kolar and Mrs. Michael S. Lewis. Michael Lewis

seven feet, and current thinking is that the houses were then thatched. The Spanish built their houses on top of the Incan walls, But these were clearly cruder, clinging together by mortar rather than by skill.

Politics are uncertain these days. One afternoon we stepped out into one of the narrow streets to discover a rather long, peaceful Communist protest march snaking along. The marchers were representatives from local farming communes who were protesting for more electricity and better roads. Women in modern skirts and sweaters but with a variety of traditional headdresses —often a piece of magenta cloth folded several times and draped on the head, and men with tall felt hats, marched by, chanting slogans, under the watchful yet perhaps sympathetic eye of the local army/police representatives in their buses.

The remarkable building skills of the Incas found expression in several other marvelous sites around Cuzco, in particular at the fortress of Sacsayhuaman, built probably between the fourteenth and fifteenth centuries. Although the boulder building technique is the same as in the city of Cuzco, the scale is expanded fifty-fold: here some boulders weigh as much as 500 tons. The fortress offers a magnificent view of the clay tile roofs and white stucco walls of the houses of Cuzco, now a town of over a quarter million. Yet, standing on the ancient stone wall and listening to a small boy, wrapped in colorful and intricately woven alpaca poncho and playing a piercing, haunting tune to his pet llama on pan-pipes, certainly evoked the mood of bygone centuries.

We visited the royal baths at Tambo Machay and the tombs at Q'enko, also on the outskirts of Cuzco, both locations used for cermonies by the ancient Inca kings. The sacred baths feature icy, sparkling waterfalls cascading through a system of stone terraces. At Q'enko there are a series of some 19 niches which were used to "sun" mummified royal ancestors and certain loyal retainers who were sacrificed, we think, when their masters died. Dr. Stanish explained that as with so much of what we visited, however, archaeologists can only hypothesize the details of usage, since the In-

The façade of La Compania is part of a 17th-century Jesuit cathedral, the most ornate of Quitos' churches. The six Solomonic columns on either side of the main entrance are modeled on those of Bernini in the Vatican. Michael Lewis

cas had no written language and thus left no record. Rather, a complicated but obviously effective scheme of knotted cords *(kipu)*, carried by the aforementioned runners, sufficed to transmit information over long distances. Fortunately, Dr. Stanish gave several impromptu lectures on Incan history and culture by drawing on current archaeological research, which in and of itself was fascinating.

We drove along the white-water Urubamba river to reach Piscar. Dr. Stanish took advantage of an important regional market to acquire several antique weavings for Field Museum from an ad-hoc fund gotten up by the Founders' Council group. These textiles are highly symbolic and convey considerable information regarding community, occupation, status, etc. of the wearer. Not only beautiful, they are of anthropological interest and also are relatively easy to store and gain access to in the Museum, so we hope these five pieces will be just the beginning of a good new collection to be augumented by subsequent expeditions and other contributors. As we strolled through the colorful market, munching on roasted giant corn kernels, we admired the many handicrafts, especially the hand-knitted alpaca sweaters and sweaters which often bore a picture of the llama itself.

The Andes range is, simply put, spectacular. The mountains rise ten, twelve, twenty thousand feet above sea level, some almost vertically. And yet on virtually every mountainside are brilliant green farming terraces which may be ancient Incan, contemporary, or both, used to farm potatoes, corn, or beans or to accommodate an occasional grazing goat or cow. These terraces often appeared to be completely inaccessible and remote, yet were clearly a part of the community agricultural activities.

At Ollantaytambo we climbed several hundred feet up some of these terraces, which were apparently used for ceremonial purposes, not farming. This fortress guards the Urubamba Sacred Valley, was an important settlement during the expansion of the Incan Empire, and probably was home to several hundred people. Today's visitor can stroll around an inhabited village that has remained mostly unchanged from Incan days and imagine what life was like then, up in these high, rugged, magnificent mountains.

Incas came to Machu Picchu to escape and hide from Pizarro and his Conquistadors; they were completely successful. However, they mysteriously abandoned the settlement in the 1570s, and Machu Picchu remained unknown to the outside world until 1911 when Hiram Bingham, having heard stories of its existence, explored the region determined to find it. Even now, Machu Picchu is remote, accessible only by train or, for the ambitious, by foot along the Inca Trail. High on the mountainside, the ruins are completely hidden from the valley. When finally at the site, the view is breathtakingly gorgeous: the extensive ruins of this final outpost of Inca civilization, encircled by even higher mountains on the other side of the crashing Urubamba River, which can be heard these hundreds of feet above it.

The settlement appears to be a complete microcosm of the civilization, accommodating royalty, engineers, farmers, workers who were all necessary for living in this place. First were the royal areas for altars, chambers, thrones, and public squares where food and drink were ceremonially divided. These buildings were all crafted from particularly fine and enormous boulders

View of the long-lost city of the Incans: Machu Pic chu. The spirit is still there. Jean Carton

In the sleepy valley of Ollantaytambo, an inn—Alahambra II. Jean Carton

painstakingly brought up here and fitted together. The buildings for mere mortals (runners, farmers, etc.) were clustered on terraces close together.

As we walked in the brilliant sunshine, suddenly we were enshrouded by mist and clouds as the rains came for an afternoon's downpour complete with a dramatic show of lightning. Were the gods angry at the intrusion of modern touristadors into the confines of the Incan?

Muddy, exhilarated, tired, and happy, the Founders' Council members reacclimated from Machu Picchu through Cuzco and Lima and back to Chicago.

The voyage would have been special under any circumstances, but the contributions made by Drs. Fitzpatrick and Stanish enabled us to *start* to understand ornithology, natural history, archaeology and anthropology and to acquire a respectful realization of the research methodology used by experts to explore the mysteries of their fields.—*Louise K. Smith*

"Flowers, flowers—who wants to buy my flowers?"—on the road to Machu Picchu. Jean Carton

Beginning as a Collector

by A. S. Meek

I HAVE never regretted that first year I spent in Australia on cattle and sheep stations, tramping the bush, kangaroo-shooting. It was a jolly, irresponsible time, full of adventure and excitement; and it hardened me off finely for the sterner work that was ahead.

Mr. W. B. Barnard, a son of my friend, joined forces with me for the first expedition which I made purely for purposes of collecting. We went to Rockhampton, bought an outfit and then took a camp up in the ranges near Coomooboolaroo, staying there for three months. For the first time I had a regular collecting outfit, insect boxes, and arsenic for skins. Nowadays I do not trouble to use arsenic for preserving skins, but rely on alum, and on the use of plenty of naphthaline in packing up the skins. On this expedition we were out after all kinds of specimens—mammals, birds, and insects. I had secured through my father an order from the Hon. Walter Rothschild for three pairs of every kind of animal, whether mammal, bird, or insect that we collected. I had been collecting in a desultory kind of way all the time I had been in Australia, but on this trip I made for the first time collecting the only object of life. Unfortunately my mate suffered a good deal from rheumatism, and had to abandon the camp once for quite a long spell, leaving me alone there. That was an experience which at first I found a little unpleasant. But it fell to me so often afterwards that I think nothing now of being the only white man in a camp among savages six weeks' march away from the next white neighbour.

On this, my first collecting trip, I made not many new discoveries. I do not think it was possible to have done so, as from a Natural History point of view that part of Australia had been very well explored, at least as regards birds and butterflies. We collected, however, some interesting specimens, especially of the flying squirrels. Then, in search of something new, we went up the Johnson River, Queensland, making a camp about ten miles from the mouth of the river. Again we collected everything in the way of Natural History specimens — mammals, birds, and insects. I think I must except crocodiles, which were very plentiful there, but which we did not trouble to collect. I recollect once, when out shooting ducks in a swamp which kept us up to our waists in water, I came upon a crocodile's nest with fifty-seven eggs in it. This nest was made of swamp grass and the eggs in it were all together higgledy-piggledy. The eggs of the crocodile are hatched out by the heat from the fermentation of the vegetable heap in which they are laid. The Australian scrub hen also lays her eggs in a vegetable heap, relying on fermentation to bring the young out, but in the case of the scrub hen all the eggs are separated from one another by layers of vegetation. There are several variations in the method of depositing eggs among those creatures which trust to natural agencies and not to brooding for the hatching out. The crocodile, as I have said, makes a vegetable mound and lays the eggs in a heap, and covers them over with more vegetable matter. The female turtle lays her eggs in a heap in the sand. The black iguana (the carrion iguana) deposits her eggs in a white-ants' mound; and leaves them there to be hatched out. The sand iguana, which does not live on carrion, lays its eggs in the sand. The crocodile, by the way, is very fond of the eggs of the scrub hen, and will often travel far inland searching for the nests.

I never thought of danger in connection with the crocodile in Northern Australia, but there is no doubt that they occasionally get a human victim. In the warm weather the crocodiles sleep in the scrub a little away from the water during the day. In the winter they sleep on the mud flats of the swamps. They usually feed in the evening, and that is the dangerous time for those who go near their haunts.

Perhaps some notes on the habits of the mound-building birds encountered in Australia and the South Sea Islands will be of popular interest, though of course scientifically they are not new. The two families of mound-building birds in Australia are the scrub turkey and the scrub hen. Several varieties of each are found in Australia and in some of the South Sea Islands. The scrub hen makes a very large nest, returning year after year to the same mound and building it to a great size. In the Solomon Islands these birds have been almost

---

"Beginning as a Collector" is from *A Naturalist in Cannibal Land*, by A. S. Meek, published in London in 1913 by T. Fisher Unwin.

domesticated, and their mounds are counted in the property of a tribe. The fermentation of the mound hatches out the eggs, and when the chicken breaks the shell it lies on its back and scratches its way out of the mound. It may be of interest to observe that there is no difference in the plumage of the male and female in the scrub hen.

Regarding the crocodiles (sometimes wrongly called alligators) of North Queensland, there are some curious popular misconceptions. One is that the armour plating on the skin will protect the animal almost completely from rifle-bullets. As a matter of fact a crocodile skin is vulnerable at any point if the bullet strikes it directly, but the skin on the back of the creature is certainly strong enough to turn aside a glancing blow. Crocodiles are very common in the nothern rivers of Australia and in most of the South Sea Islands.

I recollect at Rossel Island in the Louisiade group off the coast of New Guinea, hearing of and seeing a huge crocodile which the natives seemed to hold in a kind of veneration. They told the story that this crocodile used to bring supplies of turtle and fish for the villagers, and put these stores as food for them on a large ledge of rock. Certainly the crocodile did deposit these things as stated, but I suspect that it was not out of any love for the villagers. Possibly it might have had some connection with a habit which crocodiles are said to have, of keeping any prey they capture until it is in an advanced state of decomposition. I have heard that when the crocodile captures a calf or a human being, or any other prey of the kind, it is usual for it to hide the body away for some days before devouring it. Certainly the crocodile is a carrion feeder, and the effect of its bite, even when no actual serious wound has been inflicted, seems to be dangerous. Once at Fergusson Island, New Guinea, I was called to see a native who had been seized by a crocodile whilst fishing with nets from the shore. The man when he was seized by the crocodile cried out, and the other natives went to his assistance and managed to rescue him from the creature. When I was asked to see him two or three days had passed since he was wounded. The natives had the sick man on a platform with a fire smouldering underneath him so that the smoke should circle round him. All the wounds which he had received from the crocodile were suppurating badly and running with pus; this could be attributed to the infection of the crocodile's bite. I gave the natives some permanganate of potash to cleanse the sick man's wounds. He was all right afterwards.

After we had exhausted the resources of the Johnson River, we decided to make a move on the Bloomfield River. We chartered a small cutter to take us along the coast. The party at the time consisted of Barnard, myself, and an aboriginal boy named Tommy, who was very faithful to me and who turned out to be a very skilful collector.

On arrival at the Bloomfield River we found ourselves in country where the white man was almost unknown. The aboriginals were very numerous. We made a camp in a pocket of grass close to a jungle scrub seven miles to the north of the Bloomfield River. By this time I abandoned the collection of mammals and confined my attention to lepidoptera and birds. One of the finest birds found there was the Pitta, of which I secured many specimens. The aboriginals of the district were very clever with their spears, and could usually bring down a bird that was put up out of the scrub by a dog. I have seen one of the blacks get five or six scrub turkeys in succession whilst going through the scrub.

After staying on the Bloomfield River about three months we moved our camp to Cedar Bay, where we were the only white people and where I had the opportunity of observing the Australian aboriginal practically free from white interference. He is in my opinion a very good type of native, manly, plucky, honest, and truthful, though very lazy, except for work in which he happens to be interested. I have found Grey's observations on the Australian aborigines generally correct in my experience. The natives at Cedar Bay had exactly the equipment he decribes as characteristic: "Round the man's middle is wound, in many folds, a cord spun from the fur of the opossum, forming a warm, soft and elastic belt of an inch in thickness, in which are stuck his stone hatchet, his boomerang, and a short heavy stick to throw at small animals. His hatchet is so placed, that the head of it rests exactly on the centre of his back, whilst its thin, short handle descends along the backbone. In his hand he carries his throwing stick, and several spears, headed in two or three different manners so that they are equally adapted to war or the chase. . . . The contents of the native woman's bag: A flat stone to pound roots with; earth to mix with the pounded roots; quartz for the purpose of making spears and knives; stones for hatchets; prepared cakes of gum, to make and mend weapons and implements; kangaroo sinews to make spears and to sew with; needles made of the shin bones of kangaroos, with which they sew cloaks, bags, etc.; opossum hair to be spun into waistbelts; shaving of kangaroo skins to polish spears, etc.; the shell of a species of mussel to cut hair, etc. with; native knives; a native hatchet; pipe clay; red ochre, or burnt clay; yellow ochre; a piece of paper bark to carry

water in; waist-bands and spare ornaments; banksia cones (small ones), or pieces of a dry white species of fungus, to kindle fire with rapidly, and to convey it from place to place; grease; the spare weapons of their husbands, or the pieces of wood from which these are to be manufactured; the roots, etc. which they have collected during the day. Skins not yet prepared for cloaks are generally carried between the bags and the back, so as to form a sort of cushion for the bag to rest on. In general each woman carries a lighted fire-stick, or brand, under her cloak and in her hand."

At this camp I managed to secure two clutches of the eggs of the rifle bird. A curious thing about the nest of the rifle bird is that the hen always seems to get a snake skin—the sloughed skin of a snake—to entwine in the fabric of the nest. I have encountered many nests of the rifle bird, and have always found a snake skin to be part of its fabric. The nests were usually built in the heads of the umbrella palms and were woven out of old vines. The eggs are of a pale pink with dark red and brown marks, striped longitudinally, as is the case with most eggs of Birds of Paradise.

At Cedar Bay I discovered a male specimen of *Charagia mirabilis,* a new species of moth described by Mr. Rothschild. The male of this species has a strong, musk-like perfume. Another discovery made by me here was of a very beautiful moth, the hind-wings rose-pink in colour, the fore-wings fawn-coloured with crimson spots bordered with white.

We had some very good pig-shooting at this camp, and also some good sport hunting for sharks and for the dugong, that curious sea mammal which is said to have given rise to the story of the mermaid, because the female has breasts of a human type and has the habit of raising the fore-part of her body out of the water. But I have always failed to mistake a dugong for a mermaid.

In 1894 I returned to Australia, having with me a man named Mr. Gulliver, whom I had known as a collector in the New Forest. At Rockhampton I picked up my old mate Mr. W. B. Barnard and also Mr. Harry Barnard, and we all went up to Cooktown. After full inquiry I had decided that New Guinea and the South Sea Islands offered better chances to the collector than West Australia. Cooktown was the best Australian seaport from which to set out for the islands. Thenceforth Cooktown was the only point of the civilised world with which I kept in close touch.

This collecting expedition was my venture solely, and the others were engaged by me as assistants. We outfitted at Cooktown and went on from there to Samarai, New Guinea, in the barquentine *Myrtle.* On the voyage across we met an Italian collector named Amido, who had been for a spell of six years in New Guinea, and I recollect many of the people on board thinking it a singular thing that he should still be alive. The reputation of the climate was very bad. The reputation of the natives was worse. I have new been in all some eighteen years in New Guinea and the Solomons, and do not consider it impossible to live there fifty years if one is reasonably careful. The average idea about New Guinea and other tropical places is that the climate is worse and the natives more savage than they really are. But one must have some rules of life.

Apart from caution in regard to alcohol I think that the most necessary thing in the tropics is to take a great deal of exercise. The chance of a lazy life of course never came my way, so that I was never tempted to loaf. But I have seen enough to conclude that it is the man who is afraid to sweat whose liver hardens or who falls ill in a tropical climate. An exaggerated fear of the sun causes more illness than it wards off.

On my first voyage to New Guinea I had still practically everything to learn in regard to the customs of the country and the precautions which it was necessary to take against disease. But now after many years' experience I find that no very elaborate preparations are necessary for a six months' dive into the New Guinea forest. I take ordinary stores of food, quinine as a remedy against fever, a little brandy for medical use if that is feasible, and my drug-case contains Epsom Salts, permanganate of potash, and chlorodyne. The most serious part of my outfitting equipment is that which is needed for the collections which I make. The butterfly hunter who contemplates a six months' plunge into virgin forest must carry a collecting outfit not differing much in character from that of a naturalist putting in a week-end in the New Forest. But he must enormously increase the quantity of his gear, and if his work is to be, as mine was, in a damp, tropical climate some special precautions are needed against mildew. On the expedition in which I am to be engaged this year (1913) I shall take a good supply of butterfly nets—sufficient for the use of the collecting boys I directly employ, and of friendly natives who can be enlisted temporarily as collectors; a supply of non-rusting pins for setting; killing-bottles with cyanide of potassium for killing small insects and syringes with acetic acid for killing large insects; pill-boxes for small insects; japanned tin air-tight and cork-lined collecting cases. It is simple enough on paper; not so simple when it has to be carried strung on poles by bearers through the mountain jungles. **FM**

Gensburg-Markham

This 100-acre gem of original prairie offers a rare view of Chicagoland as it must have been centuries ago. Thanks to concerned citizens, it has been saved from commercial development.

by Jerry Sullivan

The Indian Boundary Prairies are scattered over parts of four sections of land in Markham, a suburb about 25 miles southwest of the Chicago Loop. The fragments form an archipelago, a chain of island refuges poking up through the expressways and subdivisions like the last remnants of a lost continent. I-294 marks their eastern border, and I-57 cuts right through them, separating the western prairies from the rest.

The main island in this chain is the 100-acre Gensburg-Markham Preserve, a patch of Illinois tall-grass prairie that somehow came through the past 150 years almost unscathed. It may have been lightly grazed. A few acres were plowed, but the prairie has reclaimed the old fields so thoroughly that this plowing might have remained undiscovered if aerial photographs had not revealed the furrows.

The flowery meadows surrounding the raw frontier town of Chicago in 1837 must have looked a lot like Gensburg-Markham. The imported Irishmen who dug the Illinois-Michigan canal cut their ditch through fields like these, fields thick with fiery lilies, white wild quinine, purple leadplant, and blazing star, cream false indigo, golden prairie dock, and royal-blue fringed gentians—hundreds, thousands of plants extending to tiny dots of color in the distance.

In June and July, the bobolinks at Gensburg-Markham sing their tinkling flight song above the little bluestem and flowering spurge. This is the only prairie in Cook County large enough to support bobolinks, meadowlarks, and Henslow's sparrows, the only

Eastern meadowlark Copyright © Ron Austing, The National Audubon Society Collection/PR

Chicago writer Jerry Sullivan writes frequently on natural history for the Bulletin. *He does a column, "Field and Street," for the* Chicago Reader *and has done features on birds for* Audubon *magazine and other national publications. He was also editor of* Chicago Area Birds, *published in 1985 by Chicago Review Press.*

Henslow's sparrow

Copyright © 1977 Steve Maslowski, The National Audobon Society Collection/PR

place where these animals and these plants, the halves of the old ecosystem, still survive together.

The Gensburg-Markham Preserve passed into the public trust in 1973, when the Gensburg brothers donated about half of the land to the Nature Conservancy, the Conservancy acquired the rest, one lot at a time, and passed the whole package along to Northeastern Illinois University, which manages it. Three more islands in this archipelago are now being added to the protected list, more than doubling the size of the preserve. One of the new parcels borders Gensburg on the north. The other two, called Paintbrush Prairie and Sundrop Prairie, lie to the west across I-57.

The protection of these prairie lands will conclude a process that began nearly 30 years ago, a process whose history reveals some of the changes the past three decades have made in the things we see when we look at the world.

The Indian Boundary Prairies have managed to survive this long through a series of historical accidents. They could have been plowed from edge to edge, but they weren't. They could have been grazed so heavily that the cows' favorite food plants were extirpated and replaced with Eurasian weeds, but they weren't. They could have become rows of houses or shopping malls, but they didn't.

A very large historical accident called the Great Depression kept the houses off the land. The prairies had been platted in the late 1920s and sold off as individual building lots, but the crash came before construction began. It wasn't until the end of World War II that building again became possible; but somehow, this didn't happen. Owners died and willed their lots to their children, who found no market for them. Many lots became tax delinquent.

Bobolink nest with young

Copyright © 1983 Virginia Wetnland, The National Audobon Society Collection/PR

Gensburg-Markham Prairie in late summer, blazing star in bloom Ron Panzer

Meanwhile, a few knowledgeable people were aware that there was something special growing on these obscure acres in a modest southern suburb. Floyd Swink, now chief taxonomist of the Morton Arboretum, visited a few times. Karl Bartel, a birder and botanizer from nearby Blue Island, knew of the place. But the process that has culminated in the preservation of the land began about 1960 when Robert Betz, on a visit to his wife's cousin in Markham, decided to take a walk through some nearby fields.

Dr. Robert Betz is a biologist, a professor at Northeastern Illinois University and a Field Museum research associate. His schooling at IIT was in biochemistry. In 1957, he was on the faculty at Chicago Teachers College, the predecessor of Northeastern Illinois. He was one of several teachers cooperatively conducting an intensive summer course in field biology. Just by accident, Betz replaced another teacher on a field trip led by Floyd Swink. Swink took Betz and his students to the Sante Fe Prairie, a remnant along the Des Plaines River owned by the railroad. With Swink leading him, reeling off the scientific names of plants, Robert Betz was introduced to the dominant landscape of his native state. The experience changed his life. Ever since, he has devoted himself almost exclusively to the study of prairies and to the effort to preserve and restore our native grasslands.

His was a lonely cause in the early days. The public awareness of prairie had sunk to zero. Nobody but a few botanists knew what a prairie was. No conservation agency thought it worth spending money to protect prairie lands. The biggest and best of the remaining Chicago-area prairies were being overwhelmed by the post-war boom in suburbia with almost no one to protest their passing or mourn their loss.

On that fateful walk, Betz, his eye trained by experience, knew immediately that he was on to something special. Soon after, Swink confirmed his judgement by conducting a plant survey of the land. This was very high quality prairie, with many species present in considerable numbers. But could anything be done to protect it?

In the summer of 1967, Betz invited scientists from local universities and leading conservationists to meet on the prairie to see what was there and to talk of how to save it. Some of those who took part in that meeting thought that saving the prairie would be impossible. The land was too valuable; some kind of development was inevitable.

But at least one person visiting the prairie that

day, Gunnar Peterson of the Open Lands Project, disagreed with that pessimistic judgement. He decided that if the land was worth saving then it was worth trying to save, and he and Betz began to work together to arrange a deal.

They got a break from an unlikely quarter. Those same fortuitous relatives of Mrs. Betz were members of the Markham Garden Club, and they asked Betz to talk to the group about the local prairie. The president of that Garden Club was a chemical engineer named Thorpe Dresser, who also happened to be a member of the Markham Planning Commission. He was so impressed by Betz that he invited him, Peterson, and Ray Shulenberg of the Morton Arboretum to testify before the commission. Their testimony so impressed the commissioners that they voted in favor of establishing a preserve and put Dresser in charge of a committee to see to the matter.

Four-week-old gray fox near den in Gensburg-Markham Prairie.
Ron Panzer

This was a big step and the cause of much jubilation, but at that point none of the prairie supporters even knew who owned the land on their would-be preserve, so a few details still had to be ironed out.

Miraculously, everything worked. Northeastern Illinois University agreed to accept the land. The Gensburg brothers, who owned about half the property, agreed, after discussions with Gunnar Peterson, to donate their holdings. The federal Land and Water Conservation Fund provided the money to buy the rest. The Nature Conservancy did the dog work, arranging closings on 300 separate building lots whose owners were scattered all over the country. The paperwork got so deep that the Illinois Chapter of the Nature Conservancy was cited by the national organization for initiating more acquisitions than any other state unit. The acquisitions in question were the hundreds of lots on the Gensburg-Markham Prairie.

By 1975, the whole 100-acre block was safely in the hands of Northeastern Illinois, and as sole property owner, the university could ask the city of Markham to vacate the rights-of-way it held for streets, sidewalks, and alleys.

Ecological management had already begun with the first controlled burns in 1972. The tall-grass prairie of Illinois is a fire-dependent ecosystem. In the pre-settlement landscape, Nature set many of these blazes, but the Indians also burned the prairies to keep the hunting good. The odds against natural fires—caused by lightning, for example—are very long on small parcels of land. Small boys sometimes take on the ecological role of Indians, and prairies are so flammable that a couple of kids with a book of matches can have one blazing merrily in a few minutes. At Markham, the occasional fire caused by nature or set by boys had not completely stopped the invasion of the prairie shrubs and trees; but the controlled burning program combined with a bit of sawing has turned the preserve into a pure grassland, where the only woody plants are the prairie willows and leadplants—native species adapted to fire.

Under Betz's direction, a chain-link fence was built around the preserve and a public education process begun to let the neighbors know the significance of this patch of native grassland. Karl Bartel became the first custodian of the prairie. After four years on the job, he retired. Ron Panzer, the current site manager, replaced him.

Panzer had been an insurance company engineer rating the fire safety of factories when a life-long

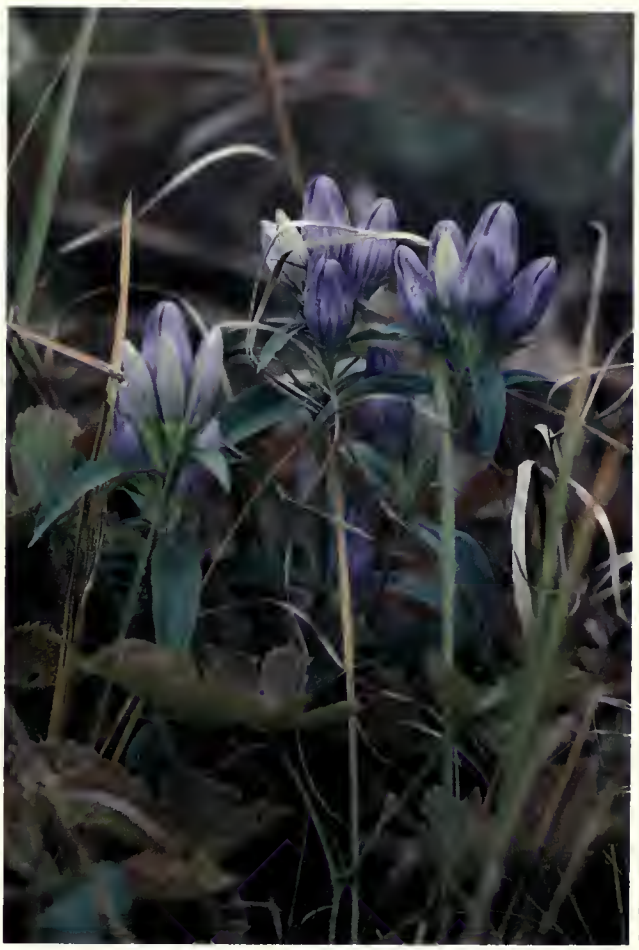
interest in wildlife took him back to school. Enrolled as a graduate student in biology at Northeastern, he became one of Betz's students and caught the prairie fever from him. Panzer's major interest is the animals of the prairie, especially the insects, and with a job that brings him to Gensburg-Markham seven days a week, he was in a perfect position to begin cataloging the diversity of animal life on this rich prairie remnant.

Ask him what he found, and you'll get a litany, a list that goes on and on of rare butterflies and moths, obscure leafhoppers, grasshoppers, and katydids found nowhere else in Illinois, endangered snakes, and foxes seldom seen.

In midsummer, clouds of aphrodite fritillaries—rich orange butterflies spotted with black and silver—dance attendance on the prairie lilies, and the prairie shimmers with Acadian hairstreaks—soft gray butterflies marked with red and gold. "It's a window into the past," Panzer says, a look at a time when these beautiful insects were "as common as mosquitoes."

A quick, experienced eye like Panzer's will also notice the tiny gold and brown byssus skippers—butterflies whose caterpillars feed on big bluestem, a dominant prairie grass. They are known from only about 15 sites in Illinois. Markham also supports a substantial population of even rarer two-spotted skipper—a sedge-feeder known from less than 10 sites in Illinois.

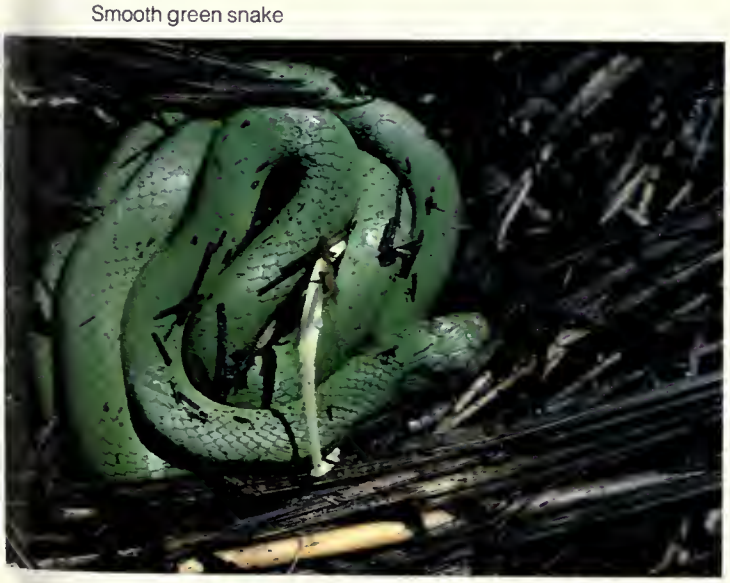
Sliding through the grass is a rare smooth green snake, another indicator of high quality prairie, and for the past three years Panzer has been hearing the clicking call of the yellow rail, a bird so elusive we can only guess at its numbers.



Ron Panzer

Soapwort gentian, a rare prairie species in the Chicago area.

Smooth green snake



Ron Panzer

At the right season, you might also hear the chirping call of the Franklin's ground squirrel, a tallgrass prairie native that had vanished from Markham until Betz and Panzer reintroduced it. Most of the ground squirrels in Illinois these days are the thirteen-lined species, a short-grass animal that has adapted quite well to golf course and lawns. Franklin's is a bigger animal—about 15 inches long, compared to the 7- to 11-inch thirteen-lined—and its back is unstriped.

Introductions are always a tricky business. Failure is much more common than success. But Betz and Panzer collected some animals from unprotected prairie sites and turned them loose at Gensburg. They waited three years and then set out some traps. The first six animals they caught were lactating females—mothers in the process of rearing young. They quickly released the animals and went off to celebrate.

Sand cherry, a very uncommon species in Illinois Ron Panzer

The gray foxes were on the prairie all the time, although the first time Betz and Panzer saw them they did not know what they were. They caught a glimpse of a canid they suspected might be a coydog, a cross between a dog and coyote. It took a second sighting for them to realize they had a gray fox, a scarce animal in these parts, much rarer than the red fox. Continued investigation revealed that the prairie shelters two or three active dens.

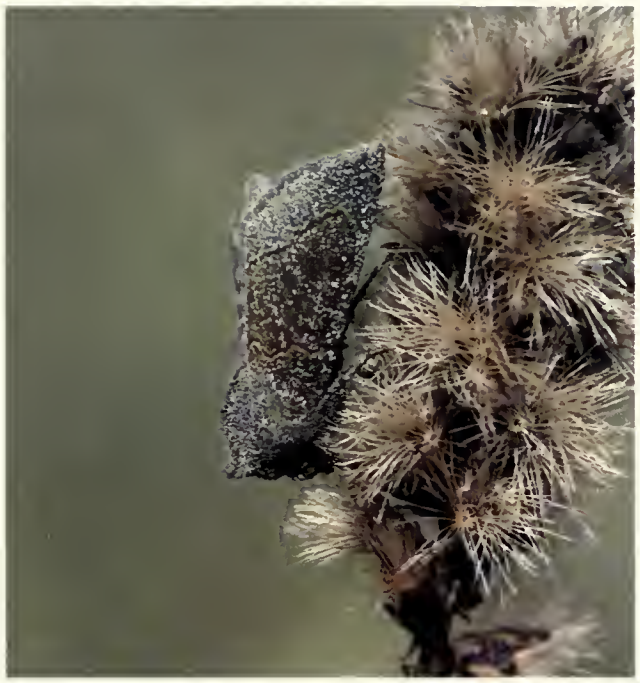
The rarest creatures Panzer has discovered so far are certain moths of the genus *Papaipema.* These are borers, insects that lay their eggs in the stems and roots of plants, and each species is dependent on a particular host plant. The fortunes of the moths rise and fall with the plants.

On the 100 acres of Gensburg-Markham, Panzer has found nine species of *Papaipema,* each dependent on a prairie plant, each rare because prairies are rare. "This is almost unrivaled as far as our knowledge extends," he says, although he emphasizes that not much work has been done with the genus.

Capturing moths means staying up most of the night, so moth hunters need an occasional nap during the day, which is why Panzer was asleep in the cab of his pick-up on the September morning in 1984 when Cal Barber drove up with news of what he thought might be a previously undiscovered prairie west of I-57.

Barber had grown up in Markham. He attended high school there and since graduation had been working as a carpenter. He had no formal training in botany beyond high school biology class, but he had a good mind and a sharp eye. One day he noticed a beautiful blue flower blooming in the field next to his mother's house. He had never seen anything like it before, so he called the Morton Aboretum, where he was referred to Floyd Swink.

From Barber's description, Swink realized that the plant was a fringed gentian, a flower that you are unlikely to find in your average weedy vacant lot. He



Papaipema beeriana. This rare midwestern prairie moth feeds on blazing star. Ron Panzer

came out and looked over the land and realized that Barber had discovered a prairie that had completely escaped the notice of all the authorities up until then.

Panzer knew nothing of this when Barber woke him from his nap. Panzer had encountered such people before, people who wanted him to come see their prairies. He preferred to turn them down because their prairies usually turned out to be fields full of introduced plants such as Queen Anne's lace and he didn't relish the job of telling them that their prairies were actually just weedy meadows.

"I'm busy," he told Barber.

"No you're not," Barber responded. "You're just sleeping in your truck."

So Panzer followed Cal Barber to his find and, like Swink, immediately realized that the field was indeed a previously unknown bit of prairie.

The discovery came at a critical time in the life of Cal Barber. He had been drifting. Married and the father of two children, he was recently divorced. He had come home to his mother's house because his doctor had told him he had cancer and could no longer work. At a moment when he could have given up and just waited for death, he had found something to give his life a focus. He had a cause that could harness energies he may not have known he had. He resolved to save all the remaining prairie lands in Markham.

The obstacles were formidable. The board of directors of the Illinois chapter of the Nature Conservancy had formally declared that its Markham prairie project was over. The long, complex, frustrating, expensive process of acquiring 300 lots on the Gensburg preserve had been so difficult that the organization didn't want more of the same. The Conservancy was also unwilling to buy land if there was nobody available to manage it properly.

And then there was the city of Markham itself. Markham is not one of the richer suburbs, and the idea of removing a couple of hundred more acres from the tax rolls might meet with some opposition.

Barber went to work on both fronts. Tooling around town in a pick-up truck bearing a bumper sticker that read "Ask me about my prairie," he became the functional equivalent of a precinct captain, ringing doorbells on behalf of an ecosystem instead of a candidate. He sat in living rooms all over town, talking to people one or two at a time, telling anyone who would listen about the treasure hidden in these vacant lots.

He began to get support. Many people who had grown up in Markham had played in those prairies. As adults, they still enjoyed the flowers. They may not have known of the significance of this land, but they were prepared to hear about it and respond positively.

Byssus skipper on purple prairie clover. This butterfly is rare in Illinois prairies. Ron Panzer

The Friends of the Indian Boundary Prairies—they adopted the name because the boundary line set down in an old treaty between the U.S. and the Potawatomi Indians runs right through the archipelago—became fixtures at public meetings, lobbying the politicians, convincing the community that the highest and best use of this land was as a nature preserve, a preserve that would enhance the quality of life for the residents and, incidentally, attract outsiders who might spend a few bucks during their visit.

The Friends also began the job of stewardship on the prairies. Vacant land in urban areas attracts junk as surely as flowers attract bees, so the first job was to gather the old roofing shingles, broken-up pieces of concrete, and just plain garbage that littered the prairies. City trucks from Markham and the neighboring city of Midlothian carried off the collected garbage.

The Friends were effective enough to gain the support of city government. Evans Miller, the mayor of Markham, became one of their most enthusiastic backers. The city council voted in favor of setting the prairies aside as nature preserves.

They also swayed the Nature Conservancy, which decided to reopen its Markham file after the Friends demonstrated their ability to care for the land.

The Conservancy, the City of Markham, and the county worked out a three-way arrangement for the acquisition of the new lands. Almost all the property was tax delinquent, so the county agreed to buy it for the cost of the unpaid taxes. The land would then be deeded to the city of Markham, which would sell it to the highest bidder, provided that the bidder agreed to dedicate it as an Illinois Nature Preserve, a stipulation that pretty well eliminated any bidders but the Nature Conservancy.

So once again, the Conservancy found itself neck-deep in paper, but this time there was a major difference. The Friends of the Indian Boundary Prairies rounded up volunteers to spend days in the offices of the Conservancy's law firm tracking down the last known owners of the more than 750 lots involved in the transaction. The volunteers compiled tax histories and also recorded the legal description of each property. Paralegal work of this kind is usually billed at $50 an hour. At that rate, the volunteers donated the equivalent of $20,000 to the task. Things have indeed changed since Robert Betz caught the prairie fever 30 years ago.

And now on May 23, the National Park Service recognized the extraordinary quality of these lands and dedicated the Markham Prairies as a National Natural Landmark.

The one sad note in this is that Cal Barber did not live to see his hard work come to success. He died of cancer in 1986 at the age of 35. He spent the last painful months of his life surveying populations of rare plants on his prairies. **FM**

Aphrodite fritillary on butterfly weed. Ron Panzer

FIELD MUSEUM TOURS

An Extraordinary
Exploration of China
September 14-October 5, 1988

Antarctica—*Discovering the Antarctic Peninsula, Strait of Magellan, Tierra del Fuego, and Cape Horn aboard the "Illiria"*
February 17-23, 1989

Kenya/Tanzania Safari
February 11-March 3, 1989

Egypt
Includes 5-day Nile Cruise
January 25-February 11, 1989

Galapagos Islands
March 3-14, 1989

For reservations, call or write Dorothy Roder (322-8862), Tours Manager, Field Museum, Roosevelt Rd. at Lake Shore Dr., Chicago, Il 60605

Field Museum of Natural History
Membership Department
Roosevelt Road at Lake Shore Drive
Chicago, IL 60605-2499

MISS MARITA MAXEY
7411 NORTH GREENVIEW
CHICAGO IL 60626

FIELD MUSEUM OF NATURAL HISTORY BULLETIN

September 1988

AFTER HOURS: FILMS AT THE FIELD

Featuring Japanese and Chinese Films

In September and October

See pages 4-5

Field Museum of Natural History Bulletin

Published since 1930 by
Field Museum of Natural History
Founded 1893

Editor/Designer: David M. Walsten
Production Liaison: Pamela Stearns
Staff Photographer: Ron Testa

BOARD OF TRUSTEES

Robert A. Pritzker
Chairman
Mrs. T. Stanton Armour
George R. Baker
Robert O. Bass
Gordon Bent
Mrs. Philip D. Block III
Willard L. Boyd,
President
Robert D. Cadieux
Worley H. Clark
James W. Compton
Frank W. Considine
William R. Dickinson, Jr.
Thomas E. Donnelley II
Thomas J. Eyerman
Marshall Field
Ronald J. Gidwitz
Clarence E. Johnson
Richard M. Jones
John James Kinsella
Robert D. Kolar
Hugo J. Melvoin
Leo F. Mullin
James J. O'Connor
Mrs. James J. O'Connor
James H. Ransom
John S. Runnells
Patrick G. Ryan
William L. Searle
Robert H. Strotz
Mrs. Theodore D. Tieken
E. Leland Webber
Blaine J. Yarrington

LIFE TRUSTEES

Harry O. Bercher
Bowen Blair
Stanton R. Cook
Mrs. Edwin J. DeCosta
Mrs. David W. Grainger
Clifford C. Gregg
Mrs. Robert S. Hartman
Edward Byron Smith
John W. Sullivan
J. Howard Wood

CONTENTS

September 1988
Volume 59, Number 8

SEPTEMBER EVENTS AT FIELD MUSEUM 3

ON THE TRAIL OF ERIK THE RED IN ICELAND
By Wendell H. Oswalt 6

THE A. B. LEWIS COLLECTION FROM MELANESIA: 75 YEARS LATER
By Robert L. Welsch, Research Associate in Anthropology . . 10

NEW BRITAIN NOTEBOOK
By A. B. Lewis 16

DISTILLING THE TRUTH ABOUT ETHANOL
By Larry Dombrowski 29

FIELD MUSEUM TOURS 31

COVER

The camera lens of Chicago nature photographer Laszlo Nagy observed this familiar summer scene: a bumblebee visiting one of his favorite wildflowers, the thistle.

VOLUNTEER AT FIELD MUSEUM

Learn something new or share your expertise—a wide variety of challenging and rewarding volunteer opportunities for either weekdays or weekends are currently available. Please call the Volunteer Coordinator at (312) 922-9410, extension 360, for more information.

Field Museum of Natural History Bulletin (USPS 898-940) is published monthly, except combined July/August issue, by Field Museum of Natural History, Roosevelt Road at Lake Shore Drive, Chicago, IL 60605-2496.

Copyright ©1988 Field Museum of Natural History.

Subscriptions: $6.00 annually. $3.00 for schools. Museum membership includes *Bulletin* subscription. Opinions expressed by authors are their own and do not necessarily reflect the policy of Field Museum. Unsolicited manuscripts are welcome. Museum phone: (312) 922-9410. Notification of address change should include address label and be sent to Membership Department. Postmaster: Please send form 3579 to Field Museum of Natural History, Roosevelt Road at Lake Shore Drive, Chicago, IL 60605-2496. ISSN: 0015-0703. Second class postage paid at Chicago, Illinois and additional mailing office.

EVENTS

ADULT COURSES

Adult courses begin again in late September, offering an exciting selection of programs featuring Chinese popular art, scientific illustration, Indian beadwork, and much more! To register, use coupon below. For further information, please call (312) 322-8854.

Indian History of the Western Great Lakes

Compared to other aspects of American history, little is known of the history of the Great Lakes Indians. Historians and scholars are now paying closer attention to the Indian perspectives of their own history. Explore these perspectives in a special six-week series on the Indian history of the western Great Lakes.

September 27

☐ **An Overview of Indian History in the Western Great Lakes**
Helen Hornbeck Tanner, Historian, D'Arcy McNickle Center for the Study of the American Indian, Newberry Library

October 4

☐ **Frontier In Transition**
Helen Hornbeck Tanner, Historian, D'Arcy McNickle Center for the Study of the American Indian, Newberry Library

October 11

☐ **The Black Hawk War and the Removal Period**
Nancy O. Lurie, Curator of Anthropology, Milwaukee Public Museum

October 18

☐ **Distilled Knowledge in Indian Legends**
Keewaydinoquay, Elder of the Anishnabeg, Ph.D. Candidate, Department of Botany, University of Michigan

October 25

☐ **Chicago's Indian Community**
Dorene Wiese, Dean of Administration, Truman College

November 1

☐ **Politics and the Future of Western Great Lakes Indians**
George Cornell, Associate Professor, Native American Institute, Michigan State University

Tuesdays, 7:00-9:00 p.m.; September 27-November 1 (6 sessions); $45 ($35 members) entire series. Single session registration: $10 ($8 members).

Traditions in Japanese Art: The Boone Collection

Focusing on selected objects on display in the Boone Exhibit, explore issues, problems, ideas, and traditions in Japanese art.

Wednesday, 7:00-9:00 p.m.; September 28 (1 session); $15 ($10 members).

Folktales from around the World

The drama and history of human life is preserved and retold in language and culture. Each week, a different speaker looks at varying themes of world folklore and oral tradition. Topics include "The Female Hero in Folktales," "African and African-American Folktales," and "Chicago Legends and the Modern Urban Folktale."

Wednesdays, 7:00-9:00 p.m.; September 28-November 2 (6 sessions); $60 ($50 members).

Continued ▷

ADULT COURSES

Registration

Be sure to complete all requested information on this registration application. Adult course advance registrations are confirmed by mail. For registrations received less than two weeks before the class begins, confirmations are held at the West Door on the first night of class. Phone registrations are accepted for adult courses using Visa/MasterCard/Amx/Discover. Please call (312) 322-8854 to register. For further registration information, consult the September/October Adult and Family Program Brochure.

Return complete registration with a self-addressed stamped envelope to:

Field Museum of Natural History
Department of Education, Adult Programs
Roosevelt Road at Lake Shore Drive
Chicago, IL 60605-2497

Name _____

Address _____

City _____ State _____ Zip _____

Telephone: Daytime _____ Evening _____

☐ Member ☐ Nonmember

American Express/Visa/MasterCard/Discover

Card Number _____

Signature _____ Expiration Date _____

Program	#Member Tickets	#Nonmember Tickets	Total Tickets	Amount Enclosed
Indian History Series AC88301				
Indian History Single Session AC88302 (please specify date)				
Folktales AC88309				
Japanese Art AC88306				
			Total	

☐ Scholarship requested

EVENTS

EDWARD E. AYER SERIES

Thursdays in September; beginning September 8; 1:30 p.m., James Simpson Theatre. Lectures are free and refreshments are served.

September 8

☐ **The Galapagos Islands**

John Fitzpatrick, Chairman and Curator,
Department of Zoology, Field Museum

The Galapagos Islands hold a unique place in the history of biology. They are as important to scientific study today as they were to Darwin in the 1850s. Examine what makes the Galapagos such an important site to observe and study evolution in action.

September 15

☐ **The World of Gems**

Tedd Payne, Graduate Gemologist

Gems have captured our hearts and minds for centuries. Look at a wide variety of gem stones from around the world. Learn where they come from, why stones vary in quality and how to spot a good buy!

September 22

☐ **Wall Painting of Ancient Mexico**

Donald McVicker, Associate Professor,
Department of Sociology and Anthropology,
North Central College

Teotihuacan was Mexico's greatest pre-Hispanic city. Its painted walls remain one of the highest expressions of pre-Columbian art. Teotihuacan's murals communicated royal and priestly messages to its vast population. Today these messages reveal the social structure and values of a vanished civilization.

September 29

☐ **Science in Soviet Museums**

Matthew Nitecki, Curator, Department of
Geology, Field Museum

The nature of scientific research in Soviet museums is similar to that in the great museums of the West. The structure of the scientific community and the intellectual atmosphere are quite different. Dr. Nitecki looks at Soviet curators and their work at some of the Soviet Union's major museums.

AFTER HOURS: FILMS AT THE FIELD

Fridays, September 9-October 14
West Entrance

Free!

Field Museum continues its series of films from around the world. Films from Japan are featured September 9-23, Chinese films are highlighted September 30-October 14. Light fare and beverages are available before the films at the After Hours Cafe. Films begin at 6:00 p.m. For more information call (312) 322-8855.

JAPAN

☐ *September 9*
"Tampopo"
1987. 114 minutes. Color. Director: Juzo Itami.
Japanese with English subtitles.

Tampopo is a zesty concoction of three themes: movies, sex, and food—especially food. A tall, dark, cowboy-hatted stranger, Goro, transforms an ordinary noodle shop owner, Tampopo, into the queen of her noble profession. The film's "pot-luck" structure continually spins off into parodies, vignettes, digressions, and assorted tasty situations, all related to food and always returning to the amusing tale of Goro and Tampopo.

☐ *September 16*
"The Ballad of Narayama"
1983. 128 minutes. Color. Japan.
Director: Shohei Imanura.
Japanese with English subtitles.

Set in northern Japan a century ago, *The Ballad of Narayama* depicts one of the most astonishing of Japanese legends. The laws of an isolated and impoverished village require that upon reaching the age of 70, its residents must climb to the top of Narayama Mountain and wait to die. The film depicts Orin, an aging matriarch, whose time to meet the gods is approaching. With courage, intelligence, and a youthful vitality, she prepares for her death by assuring her family will survive.

☐ *September 23*
"Demon Pond"
1980. 123 minutes. Color. Japan.
Director: Masahiro Shinoda
Japanese with English subtitles.

In a remote region of Japan in 1933, three people's lives intersect around an ancient legend: that Demon Pond is inhabited by a trapped spirit, and that if certain rituals are not carried out, the spirit will break loose. Shinoda's fable is based on the Kwaidan tradition of exquisite Japanese ghost stories, with its own audacious mix of offbeat elements. Hyper-intense colors, fairy tale sets, and a ghostly atmosphere all lead to a sensational climax.

CHINA

☐ *September 30*
"In The Wild Mountains"
1986. 105 minutes. Color. China.
Director: Yan Xueshu.
Mandarin Chinese with English subtitles.

This comedy set in the remote Qinling mountains is about two couples trying to cope with China's economic reform. Huihui is content with his simple life as a farmer; but his brother, Hehe, who has served in the army, wants to change his fate and strike it rich. Their wives, equally disgruntled with their chosen mates, find solace in their brothers-in-law. In the end there are two new couples.

EVENTS

Scene from "Demon Pond," showing Friday, Sept. 23.

☐ *October 7*
"Yellow Earth"
1984. 94 minutes. Color. China.
Director: Chen Kaige.
Mandarin Chinese with English subtitles.

Set in the steppes of China's northern provinces in the late thirties, a young soldier in Mao's army visits a remote village as he collects folksongs. In the village he is put in with one of the poorest families, a taciturn widower and his teenage daughter and son. The daughter is sold into marriage with a much older man and the soldier's talk of breaking with feudal tradition fills her with unrealistic hopes of escape. *Yellow Earth* is the first film of a new Chinese cinema with its roots in Chinese painting and music, and not the formula propaganda of the last three decades.

☐ *October 14*
"Black Cannon Incident"
1985. 107 minutes. Color. China.
Director: Huang Jianxin
Mandarin Chinese with English subtitles.

Typical of the new direction in Chinese filmmaking, *Black Cannon* deals with subjects and issues heretofore not present in Chinese films. This farce is about a misplaced chess piece. And when its owner, a well-educated engineer, attempts to find it by sending a telegram, the operator suspects it is a secret code, and here the farce begins.

Scene from "Tampopo," showing Friday, Sept. 9.

On the Trail Of Erik the Red In Iceland

by Wendell H. Oswalt

photos by the author

As a modern nation, Iceland is distinguished in many ways apart from its less-than-inviting name. Geologically, the only place the Mid-Atlantic Ridge rises to the earth's surface is in Iceland, and here too is the geyser that was so named before any others. Politically, the country had the world's first commonwealth government and, economically, it was the only European nation to become modern without the pangs of industrialization. In literature, Icelandic poetry and sagas are the most substantial extant writings in an old Germanic language. Yet, Iceland is little known among most Americans except in one respect: Americans generally are familiar with the adventures of Erik the Red and his son, Leif Eriksson, through reading either history books or sagas. Both are known because of their participation in the earliest European explorations in North America.

In outline, the discoveries of Erik and his son have been well recorded. They sailed from Iceland, possibly in the year A.D. 982, and explored southwestern Greenland, where they remained for three years. After returning to Iceland for one winter, they sailed back, this time with other ships, to settle the newfound land. From Greenland, Leif sailed to the eastern shores of Canada, where he founded at least one settlement, and in subsequent years other parties ventured from Greenland to the same region. These bold voyages and their aftermath are well known compared with earlier aspects of the life of Erik the Red, those that led to his departure from Iceland. Here I will focus on Erik's background, the sites in Iceland associated with him, and the reasons for his voyages.

Reports about events and the locale in which they are thought to have occurred are based primarily on two books written originally in Old Icelandic. The accuracy of both is marred by the mingling of historical particulars with fabrications and errors in frustrating combination. Yet, some specifics in these books have been verified, and modern scholars continue to strive to distinguish fact from error and fancy. The first pertinent work is the *Book of Icelanders,* by Ari Thorgilsson the Learned (1068-1148). This short study, written between 1122 and 1133, is primarily a synopsis of early Icelandic history and institutions. The *Book of Icelanders* generally is considered a trustworthy source because the author states that he obtained the information from those persons described or from their immediate and reliable descendants. The same Ari is thought to be the author, or one of several authors, of the second source, the *Book of Settlements,* which in its original form also dates from the early twelfth century. This volume is the only detailed account about the founding of any European nation. The biographical sketches, genealogies, and geographical place names provide a wealth of details for the period of settlement. Some information

Wendell H. Oswalt is a professor of anthropology at the University of California, Los Angeles.

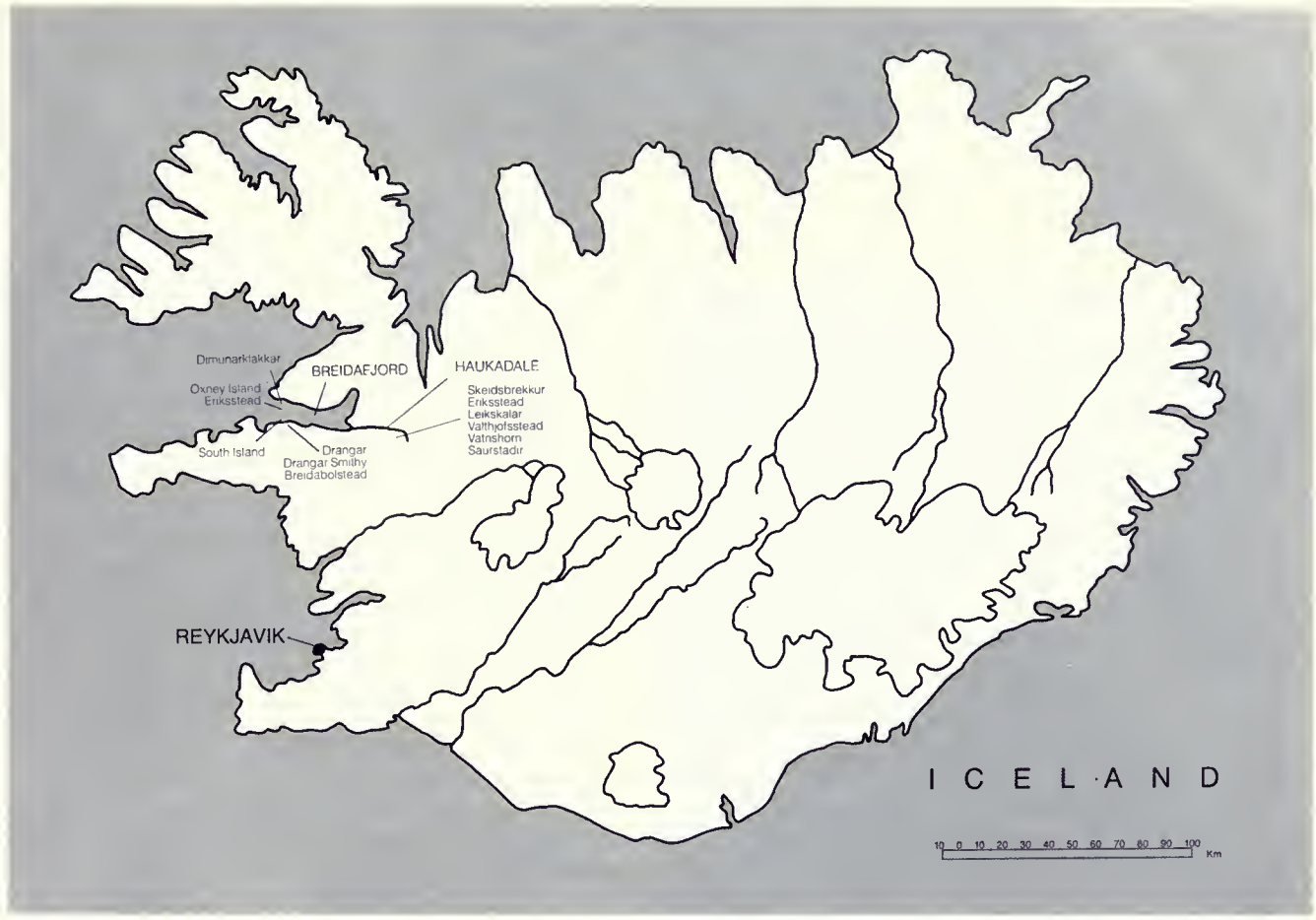
Erik the Red may have been born at Drangar on Snaefellsness Peninsula in western Iceland; he clearly was identified with the locality in his later life. A modern farm and the Drangar rocks in the background mark the locale today.

An imaginative illustration of Erik the Red appears in a book about Greenland published in 1688.

Field Museum Library possesses a facsimile edition of the largest and best preserved of the Icelandic manuscripts, the Flatey (Flat Island) Book (London, 1908). This codex, dating from the last two decades of the fourteenth century, is a compilaton from various sagas and includes, in the saga of Olaf Tryggvason, the tale of Erik the Red (in three chapters) and the tale of the Greenlanders (in seven chapters). This copy, the gift of Archives of American Art (1987), includes the manuscript facsimile, the text in Icelandic, and Danish and English translations. It may be consulted in the Library's Reading Room.

In the foreground to the right of a modern "summer house" are the reported ruins of Eriksstead in Haukadale. Across the river is the farm of Saurstadir, and in the draw to the left Eyjolf Saur is said to have been killed by Erik, which led to his banishment from Haukadale. ◂

In the foreground, where the people are standing, are the reported ruins of the original farmhouse at Valthjolfsstead. It was from the mountains behind this flat land that Erik's slaves caused a landslide, which was the first episode in the events leading to Erik's banishment from Haukadale. ◂



clearly is valid, some is imaginative, and other portions are erroneous. The original text probably was more accurate, but it has not survived. Although a few pages of early copies have been identified, most versions were written many hundreds of years after the original book had been completed. We must depend on copies made from one of the later versions, and because they were copied and recopied, sometimes with the text intentionally modified or expanded, there was ample opportunity for mistakes to become part of the final text. The sagas do not figure prominently in this analysis because information in them about Erik the Red's life in Iceland seems to have been based largely on the *Book of Settlements*, and thus they perpetuate the truths or errors found in this source book.

According to the sources used, the first Norse settlers, who landed in Iceland in the 870s, met men identified as "Papar," who clearly were Irish monks; the Irish long had known about the island and had sailed there repeatedly over many years. With the Norse arrival the Papar left, reportedly "because they did not wish to live together with heathen men." Most of the early Norse settlers came from Norway and were drawn by the availability of free land, but a large number came to escape the tyranny of Harald Finehair. He ruled for a time as a lesser king in southern Norway, but by the 870s he was succeeding in subjugating the rest of the country. Those who refused to accept his dominance and felt that resistance was futile left to begin life anew on the British Isles, with which they already were familiar, or on the recently discovered island called Iceland. The ambition and expanding power of Harald Finehair thus provided the motivation for many Norse to leave their homeland within a comparatively short period and to relocate in Iceland with others of similar persuasion. This period, called the Age of Settlement, lasted from ca. 870 to 930, and it was during the latter years that the father of Erik the Red arrived and sought land.

As the life of Erik the Red is reconstructed, published interpretations by the Icelandic historian Olafur Halldorsson, are especially valuable. The birthplace of Erik the Red is the first critical issue. The *Book of Settle-*

Continued on p. 24

The A.B. Lewis Collection from Melanesia —*75 Years Later*

by Robert L. Welsch

Dr. A. B. Lewis in German New Guinea, 1910. 33645

The notion that Museum Collections are little more than odd assortments of exotic curios remains, unfortunately, a common one. For those who continue to see museums in this way, artifacts may be pretty to look at, possibly even interesting, but these objects are nonetheless just the odds-and-ends relics of nearly forgotten cultures.

Such a view, however, is out of sync with the new look in museums, and it is certainly not the case with Field Museum's outstanding anthropology holdings.

During a year and a half of research on Field Museum's South Pacific collections, the value of this material for understanding traditional Melanesian societies has been repeatedly brought home to me while poring over more than a thousand pages of field diaries, expedition photographs, field sketches, and the expedition correspondence of Albert Buell Lewis (1867-1940), who served Field Museum as an anthropology curator from 1908 until his death.

Now yellowed from the 75 years they have sat in the Anthropology Department Archives, these documents were made during a Field Museum expedition to Melanesia (which includes New Guinea, New Britain, the Admiralty Islands, the Solomon Islands, New Caledonia, Vanuatu, and Fiji). Lewis's notes chronicle the day-by-day experiences of an anthropologist conducting field research in a region that was little known and poorly explored. They tell how and why he made his remarkable collection and provide a wealth of background information about the 12,000 artifacts he collected and the nearly 2,000 photographs he took (and

---

Robert L. Welsch is a research associate in the Department of Anthropology and has studied the A. B. Lewis Collection for the past 18 months in an effort to update documentation of the collection and to assess the collection's potential for further systematic study. Research support from the Thomas J. Dee Fund and the Walgreen Company is gratefully acknowledged. Together with anthropology curators John E. Terrell and Phillip H. Lewis, Dr. Welsch's work with the collection is intended to lay the groundwork for new field studies in Papua New Guinea—"In the Footsteps of A. B. Lewis."

developed) during the Joseph N. Field South Pacific Expedition of 1909-13.

A casual look at this inconspicuous stack of pocket-sized notebooks, with their faint, scribbled notes, gives no hint of the treasure of detailed information these pages contain.

But sorting through these notes, expedition diaries, and letters is like discovering a Rosetta Stone for interpreting and studying the thousands of objects A. B. Lewis collected. They are truly unique—the only documents by an American describing many parts of Melanesia as they were before World War I.

The A. B. Lewis Collection contains thousands of masks, carvings, and ornamented objects that have extraordinary aesthetic value as fine examples of primitive art. But the value of this collection for understanding Melanesian peoples and the societies in which they lived is immeasurably increased by Lewis's observations preserved in his notebooks and letters.

Without these notes, the research value of his collection would be minimal—they would be little more than curiosities made of bark, grass, wood, bone, and shell. It is this combination of artifacts, photographs, and documentation that makes Field Museum's collection one of the world's two great Melanesian collections (the other being at the Museum für Völkerkunde in Berlin).

The Joseph N. Field South Pacific Expedition

In the spring of 1909, Albert B. Lewis, then assistant curator of African and Melanesian ethnology at Field Museum, set off from Chicago on the Joseph N. Field South Pacific Expedition. This enterprise would keep him overseas for nearly four years on a research odyssey to virtually every accessible corner of Melanesia and several parts of Polynesia. It was an epic journey through a region which was one of the least known and most poorly explored parts of the world. It was also a journey that would make Lewis the first American anthropologist ever to conduct extensive, long-term field research in New Guinea—nearly twenty years before Margaret Mead's more famous sojourn to the Admiralty Islands.

When he returned to Chicago in the spring of 1913, Lewis had acquired what is still the largest collection of Melanesian art and material culture ever made by a single collector. It is also one of the most systematic Melanesian collections in existence.

Like many other Field Museum expeditions before World War I, the Joseph N. Field Expedition was mounted to collect material for the Museum's rapidly growing ethnological collections. When founded in 1893, Field Museum fell heir to many of the objects exhibited at the World's Columbian Exposition. But then, to establish a "great museum" on par with older museums in New York and Washington required much more extensive collections, with better documentation.

Man of Ross Island. 31908

Men of Ruoto Island. 31906

Toward this end, Chief Curator of Anthropology George A. Dorsey organized a vigorous program of Museum expeditions, sending his assistant curators to the far corners of the globe to build collections that would rival those of better known museums. Other Chicagoans shared Dorsey's vision and when he sought financial support for these expeditions Chicago's leading citizens were ready to assist. Within less than twenty years, Field Museum's anthropology holdings had achieved world-class status, the Pacific collections being one of the most outstanding.

When Dorsey nominated A. B. Lewis, his newest assistant curator, to lead an expedition to New Guinea and the Melanesian islands, Lewis had never before conducted any extended field research. Nevertheless, Lewis proved to be a remarkably able and successful field researcher. He sent back more than 300 crates of specimens that took nearly five years to catalog, more than doubling the Museum's already sizable holdings from Melanesia.

Besides the carvings, masks, and other highly decorated objects once used in the elaborate rituals of Melanesian peoples, the A. B. Lewis Collection also contains many thousands of more mundane objects in daily use: wooden bowls, knives, bags, arrows, spears, clubs, headrests, pots, clothing, ornaments, and the like—objects representing a way of life that has now largely vanished after two world wars and three quarters of a century of economic, political, and social development.

Lewis's primary objective during the expedition was to collect ethnological material that could be used in the Museum's exhibit halls. But as an anthropologist trained by Franz Boas at Columbia University, he had much broader goals for his field research. He became fascinated with indigenous Melanesian technology, the ways material culture was made and used, the unexpected volume of trade between villages, and the many variations in styles and designs from one area to another.

Men from Kamangaro. 31969

Lewis knew these societies would face many changes in the future and he made a concerted effort to document their art and material culture as completely as possible in his collection, his photographs, and his field notes. He attempted to obtain a representative sample of the local material culture in each of the hundreds of villages he visited. He acquired many examples of the same kinds of objects in order to show the many variations in design and form, especially regional variations.

His research strategy was surprisingly modern, and his letters and diaries make it clear that he intended his collection (together with his notes and photographs) to be a long-lasting resource for future researchers.

Using the A. B. Lewis Collection for Modern Research

But despite the unique importance of the A. B. Lewis materials, they are known in depth by only a handful of scholars. In part, this reflects a number of changes in anthropological research that began in the 1920s and 1930s. In the years between the wars, anthropologists shifted their interests from comparative studies of material culture to intensive field work in particular communities. These field studies examined the social, economic, and religious lives of tribal peoples through what has been called participant observation, a research method that blends direct observation, interviews, and participation in the daily lives of the people whose society and culture are being investigated.

These ethnographic studies are the hallmark of modern anthropology and have undeniably enriched our understanding of how these societies function and the ways individuals maneuver within the social conventions prescribed by their culture.

But such studies have tended to concentrate on individual communities, ignoring the regional systems of which these communities are a part. At the same time, the emphasis on ethnographic field studies has led anthropologists to disregard museum research as only narrowly concerned with primitive technology, art styles, and decorative motifs.

Our current research with the A. B. Lewis Collec-

Kaman, Lewis's field assistant, wearing cloth lap-lap and belt. 31978

Mother with child. Kamangaro. 31968

tion is an attempt to bridge the gap between these two kinds of research by combining museum-based research with intensive field studies. We are planning a new expedition to New Guinea—"In the Footsteps of A. B. Lewis"—to gather new information from many of the same communities he visited more than 75 years ago. This research literally picks up where Lewis left off by refocusing our attention on regional trade networks and the cultural variation they generated.

This innovative program will use the artifacts Lewis collected (along with the information he gathered) to guide our investigation of modern research problems about the regional trade networks that linked small, autonomous communities speaking dozens of different languages. The challenge of this research is to show how Field Museum's collections can provide new insights into old problems using modern research strategies.

House where A. B. Lewis slept, Ross Island. 31909

An Example from A. B. Lewis's Field Notes

During the course of deciphering and identifying the contents of Lewis's diaries, notes, and letters, I came across a handwritten manuscript in a tiny blue notebook, published here for the first time as "New Britain Notebook." Several times earlier I had opened it and read scattered passages to confirm how its contents related to Lewis's travels in New Britain. But I had wrongly assumed that these were drafts of rough notes later copied into his expedition diaries.

Only after I had transcribed and typed several pages of the text did I recognize that far from being rough notes, the text was a short essay describing an encounter of first contact with several of the scattered groups living in the interior along New Britain's south coast.

The manuscript was written in the spring or summer of 1910, while Lewis was in German New Guinea (now part of Papua New Guinea). Although its original purpose is not certain, it was probably the first draft of a report sent to Museum Director F. J. V. Skiff. The editorial changes, scratched out lines, and words inserted into the text on the original make it clear that A. B. Lewis had intended this essay—unlike his field diaries—to be a finished piece of prose in its own right.

It describes the first of several experiences with Melanesians who had never before seen a white man, and it offers a feel for the difficulties Lewis encountered throughout his long years of field research. Lewis had not come to Melanesia as an explorer, but he was delighted to make contact with previously unknown groups. And as he shows us, he was pleased to be the first to discover a native blow-gun east of Indonesia.

With remarkable foresight, Lewis captured and preserved a large piece of the history of Melanesian societies, much of it preserved nowhere else. His work passes on a responsibility to those of us who follow to continue the research he began nearly 80 years ago.

New Britain Notebook

by A.B. Lewis

photos by the author

THE BEGINNING OF THE YEAR found me at Arawe, a remote station and plantation belonging to E. E. Forsayth situated at Cape Merkus, on the south coast of New Britain, about 100 miles from its western extremity. Here lived the only white man on the entire south coast of New Britain. On the Liebliche Inseln (Lovely Islands) lying just off Cape Merkus were the most important and largest native villages for many miles along the coast, and the chief of one of these, Pelilo, claimed jurisdiction over about 100 miles of coast line. With Arawe as a center many trips were made to the native villages, and the following gives some incidents of an 8 day boat trip along the coast to the east for about 30 miles.

The nephew of the chief had been secured as interpreter, and with a crew of 5 native "boys" and my two personal attendants we left Arawe on the morning of January 3, 1910. We had a 4 oared boat, also supplied with mast and sail, which the crew, of course, much preferred as a means of progress, only taking to the oars when absolutely necessary. After a sail of about 3 hours we arrived at the first settlement we wished to visit.

The coast here consisted of an almost per-

Boys at Pelilo. 31962

Canoe with outrigger. Ruoto Island. 31904

pendicular cliff of coarse rock, from 200 to 300 feet high, with at places a narrow strip of sandy beach. On one of these, somewhat wider than usual, were a few houses or huts, and here we landed. We received a cordial welcome, as our interpreter was well known, and the natives were quite anxious to exchange their possessions for the European articles which we had with us. As it was near noon, a plentiful supply of taro was purchased for the boys, and dinner was soon ready.

This settlement was very small, consisting of three family houses, and one men's house, where the boys and unmarried men sleep. There were other settlements on top of the cliffs, however, where the country was fairly level, and the natives had extensive taro fields, so we decided to stop a while, and go on top and have a look around. We had to follow the beach for some way before we came to a place where we could ascend. On the way we passed a place where the cliff overhung somewhat, and in this rock shelter, with only the additional protection of a slight palm-leaf wind break, a couple of families had taken up their adobe, the women being engaged in cooking as we passed by.

The path to the top of the cliff was in places almost perpendicular and required the use of hands as well as feet. The country on top was covered with the dense tropical forest, through which our path wound for a mile or more before reaching a clearing with two or three houses.

There was little of interest here, so we passed on, and in the next 3 or 4 miles found 3 more small settlements, the last of which we reached just in time to avoid a thorough soaking from a heavy tropical shower. The shower was over in about an hour, but it was now time to go back, as I had no desire to descend that cliff after dark. We reached the beach safely about sundown, and made arrangements to stay here for the night. As it is liable to rain here most anytime, a roof is a good thing to have over one and so the natives were induced to vacate the best of their houses where my cot was set up, while the "boys" slept on the floor. In this house the floor was raised about 3 foot from the ground, while in all the others the ground was the sole floor. The roofs, of palm leaf thatch, are perfectly water tight when in good repair. It is perhaps needless to say that they are not always in good repair, as I found out to my sorrow on more than one occasion. Our sleep this night, however, was undisturbed—luckily there were no mosquitos — and shortly after sun-rise our things

Dancers, New Year's Day 1910. Arawe. 31920

were all in the boat and we were again on our way.

Here occurred an incident which may be regarded as illustrating either native honesty, or fear of the white man's power, for the government makes itself felt even in this out of the way place. The day before, while waiting at the furtherest settlement, I had had occasion to use my pocket knife, and had very carelessly stuck it in the center post of the building, thinking I would use it again and had finally gone away and forgotten all about it. The evening before I had discovered my loss, and sent word with one of the natives who had come to the beach to carry some of my purchases, that they should bring the knife to me at the beach, early next morning, as it was then nearly dark. The next morning shortly before we were ready to leave a native from the further settlement came with the knife, reporting that it had been found on the ground at the foot of the post, and had not been noticed till I sent word to return it. As I had no other pocket knife with me, I was glad to get it, tho I had hardly expected to see it again, and the native was duly rewarded.

For 3 hours we sailed along the high rocky shore, occasionally we could see the tops of a few cocoanut trees on the heights above, indicating human habita-

Dancers, New Year's Day 1910. Arawe. 31926

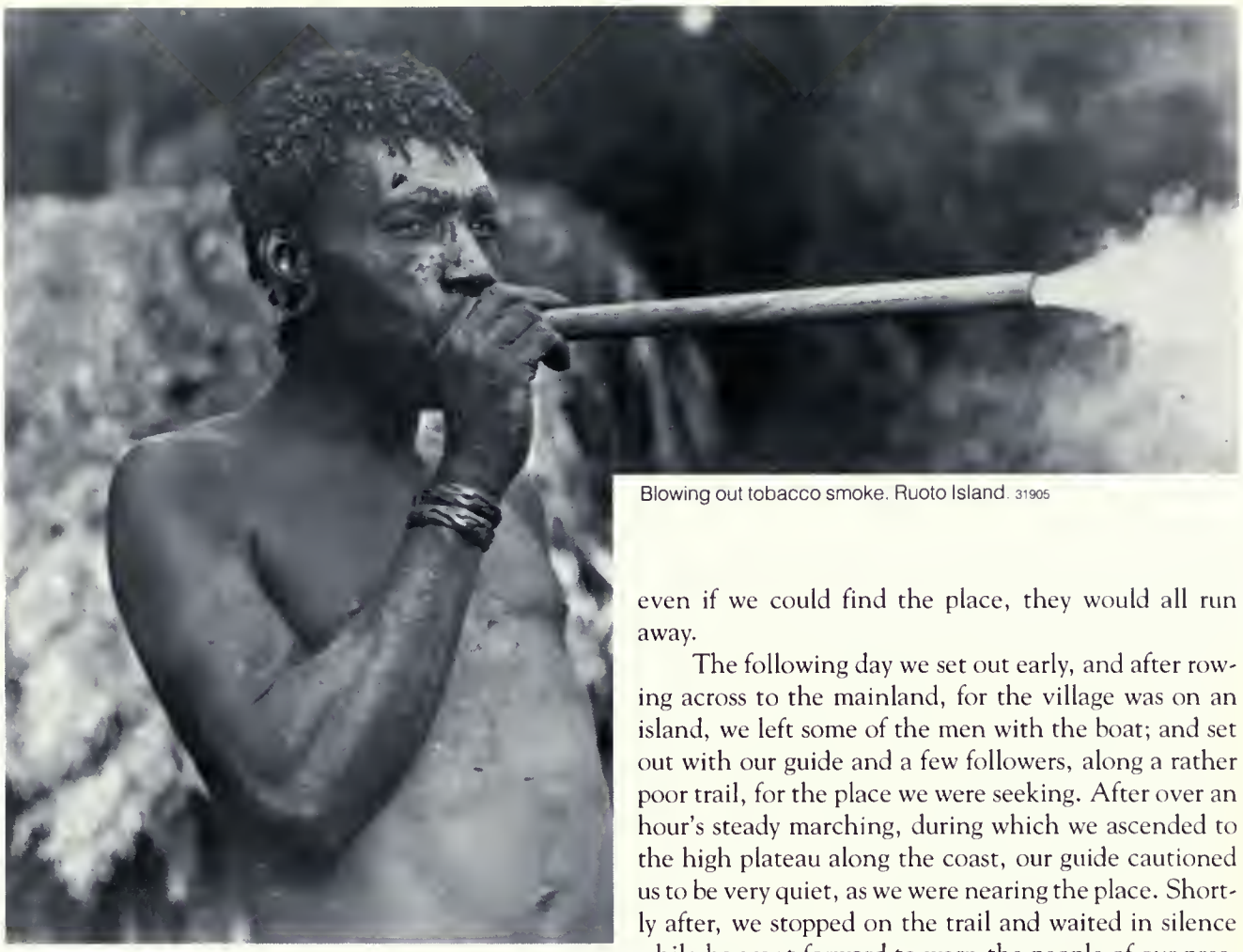
Warrior with shield and spear. Cape Merkus. 31901

tion. Once the settlement was so close to the edge of the cliff that no trees intervened, and we could see the natives, who were busy building a new house. In a few places the beach below was wide enough for a few trees and some vegetation, and in such places one or two native huts were frequently seen.

About 10 A.M. we reached a larger settlement than usual, and here landed and stayed till after noon, when we continued on our journey. It was not long till a heavy shower came up, and the rain poured. The wind was luckily from behind, and so hurried us on our course, so that by the time the storm was over we had reached another settlement of considerable size. Here the language was quite different from that at Cape Merkus, and I found many things of interest. We decided to stop for the night at a village we could see a short distance further on, but it proved to be further than it looked, as to avoid the reefs we had to make a wide circuit. There are dangerous reefs all along this coast, but my interpreter was familiar with them, so we got along very well.

Here we stayed that night, as well as the following day and night. During the day we visited some other settlement near by, and inspected their taro fields on the heights above, when we also shot some pigeons to replenish our larder. We found the people here living in constant dread of an attack by the interior or "bush" people, with whom they were at war, if the state of perpetual hostility in which many of these people live can be called war. Our "boys" were so frightened that several sat up most of the night, one at least keeping watch the whole time with loaded rifle.

From this place to Moewe Hafen, about 15 miles, there were no settlements on the coast, the bush people making that part of the coast untenable. We arrived at the chief village in Moewe Hafen on the afternoon of



Blowing out tobacco smoke. Ruoto Island. 31905

January 6th, just in time to escape another downpour. In this vicinity we remained for three days, visiting the different coast villages, and also making two trips to two settlements of an interior tribe, which here maintained friendly relations with the coast villages. This "bush" people was different, both in language and customs, from the hostile tribe to the west. This was apparently the first time these people had seen a white man.

I always made it a point to inquire at every place what villages existed in the neighborhood, and what places I might be able to visit. After several inquiries I at last found out from one of the chief men of one of the villages near Moewe Hafen, where we had first stopped that there *did* exist a small settlement of bush people with whom they had intercourse, and which it was possible to visit, as it could be reached in two or three hours from his place; so I prevailed upon him to go with us, both as guide and interpreter, and especially to assure the people of our friendliness, for otherwise even if we could find the place, they would all run away.

The following day we set out early, and after rowing across to the mainland, for the village was on an island, we left some of the men with the boat; and set out with our guide and a few followers, along a rather poor trail, for the place we were seeking. After over an hour's steady marching, during which we ascended to the high plateau along the coast, our guide cautioned us to be very quiet, as we were nearing the place. Shortly after, we stopped on the trail and waited in silence while he went forward to warn the people of our presence and prevent them from running away. After about 10 minutes he returned, and told us we could proceed. We soon reached a clearing, and after crossing a field of taro, were led to a house where we found four men waiting for us. They received us in a very friendly manner, and I was soon looking round the house, which was similar to those on the coast. I soon found an object which attracted my attention. It was a slender stick of hard wood nearly 3 feet long, pointed at one end, and with a bunch of feathers at the other. It looked very much like the arrow of a blow-gun, but I had never heard of a blow-gun in this region. The blow-gun, however, was soon discovered, and one of the natives kindly illustrated its use, so there could be no doubt about it. The tube was about 15 feet long, made of 6 pieces of a light bamboo about an inch in diameter. I succeeded in obtaining one, and as it was so long as to be unwieldy, took it apart in the middle. The joint was very carefully made. The end of one piece was inserted in the other, which had first been carefully split into a number of narrow strips, a tightly wrapped rattan band

Wrapping mashed taro in leaves for cooking. Pelilo. 31958

Making a coconut water bottle. Pelilo. 31963

preventing the splits from extending more than about 2 inches. The joint was then wrapped with leaves which were covered and held in place with a sticky gum. This made the joint perfectly air tight, and over the whole was a close wrapping of fine rattan completely covering and hiding the leaves, and giving the whole quite a neat appearance. All the pieces were evidently joined together in the same manner.

Most of the other things seen about the house were much the same as those I had seen before. This was the men's house, and as I had seen no other, I asked if I could see the family or woman's house. They replied that these were a "long way," too far for me to go. I had a strong suspicion that this was not the case, but after going out and looking around I could see nothing of them. One of my boys, however, who had also been keeping a look out, told me there was a house just behind some bushes near by. The chief man of the place was close to me, and I asked that he go with me to look at the house, as I did not wish to offend them by going by myself, when they might imagine I was into mischief. So we went toward the house, which had a covered space in front, where there were several piles of taro and a good fire on which a number of taro were cooking.

After looking around here a little, I turned to look for my companion, but found that he had suddenly disappeared. I went around to the other side of the house, where there was a door and met one of my boys who told me that he had just seen him disappearing into the bush, with a number of things which he had taken from the house. The boy also showed me a nice ornament which the man had just given him, apparently as a bribe to let him get away. By this time all the other local natives had disappeared too, so the place was deserted except for ourselves. Our guide called out to them and tried to induce some to return, but in vain. As nothing more could be done, we started to return, when two of the natives joined us, and said they would accompany us to the boats.

Family house at Amklok. 31933

On the way one of the natives disappeared for a short time, but soon returned with a cockatoo, which he said he had shot with his blow-gun. We reached the boats in safety, and the 2 natives saw us off. The chief, however, was not again seen, tho he had promised to come to the boat to get payment for an ornament, which I wished to buy, as I did not have with me the articles which he wished in exchange.

I continued to inquire of the coast native if there was not another settlement of bush people which I could visit, but could hear of none till the next day, in another village. I was told of one which I might be able to reach, tho it lay at a greater distance, and in an entirely different direction. I finally found a couple of men who said they knew the trail.

One of them could speak the languages and they were willing to accompany me, so the following day we set out. We had a long row to reach the place where we left the boat, and then a 3 hour march through the forest, where in most places my eye could not discover a sign of a trail, and even my guides lost it two or three times.

At last we came near to the place, and then came the same suspense as before, while our guide went forward to announce our coming. The wait was longer than before, for we were on the edge of extensive taro fields, and it took some time to find any one, but at last we were told to come on. We crossed one large taro field, climbing a very substantial fence on each side, erected to keep out the wild pigs. We then crossed a small stream, and climbed over a fence into another taro field, on the far side of which soon saw a peculiar structure. The fence was everywhere else about 5 feet high, strongly made of poles laid horizontally on top of each other, held in place by upright posts on each side, bound to each other with rattan. In front of us, however, appeared a peculiar barricade like structure, continuous with the fence on each side, at least 10 feet

Men of Kumbum. 31946

Men's house at Kauutumate. 31953

Ornamental tree and young coconuts in an enclosure to keep pigs out. Pelilo. 31957

high and 20 feet long, with a small opening or door in the center. On passing through this door, the front of the house appeared about 20 foot away. The house was the same as we had seen before.

Here also blow-gun and arrows were seen. The men were friendly, but I did not inquire for the family houses, and they were not to be seen. We were in no way prepared to stay over night, even if we had been allowed to do so. We had a long journey before us and dangerous reefs to pass before we could reach the village where we were stopping, so our visit could not be of long duration. We soon were hastening back through a pouring rain, and finally reached our stopping place, just as night closed down. We found that the villagers had done their best to prepare us a bountiful repast, even if in native style, and we were quite ready to appreciate it.

Unfortunately my time was limited as I had to be back before the time arrived, so I was unable to see more of these interesting and practically unknown people. **FM**

ments states that a man named Thorvald Asvaldsson left Norway "along with Erik the Red, his son, because of killings they were involved in, and they took possession of land in the Hornstrands. They made their home at Drangar, where Thorvald died." According to this text Erik would have been youthful when he and his father migrated to the northwestern sector of Iceland. The same source reports that after his father's death, Erik married Thjodhild, whose family lived at Haukadale, a valley at the eastern end of Breidafjord. Erik settled near the home of his father-in-law at a locale called Eriksstead. These particulars are straightforward in this report and are repeated in *all* of the standard accounts about the life of Erik. Notwithstanding, Halldorsson suggests an alternative as more reasonable. Perhaps the father of Erik the Red arrived from Norway alone and settled at Breidafjord, where he married and where Erik may have been born and reared. Halldorsson's reasons for proposing this position are summarized in the following paragraph.

"Erik the Red was the name of a man from Breidafjord," wrote Ari the Learned in his only reference to Erik in the *Book of Icelanders*. For Ari to describe Erik as "a man from Breidafjord" is critical evidence about his birthplace, according to Halldorsson. The preposition "from" suggests that Erik was born at Breidafjord, not in Norway. In other instances Ari refers to some persons as being *from* particular regions, and they are known to have been born in the localities mentioned. Furthermore, Ari lived in western Iceland and was well acquainted with the history of Breidafjord. Another point made by Halldorsson is that if Erik had been from Norway, as reported in the *Book of Settlements*, he would have been identified by Icelanders as a "Norse man" throughout his life.

A second reason to associate Erik with Breidafjord throughout his life is his placement in the sequence of information presented in the *Book of Settlements*. The accounts about settlers follow a clockwise pattern around the island beginning in the southwest. The entry about Erik the Red is placed with those from the Breidafjord area, not with entries for the Hornstrands, considerably farther north.

The third reason is the most compelling one. When Erik fought against a descendant of a settler at Breidafjord, he had as staunch allies men from other families in the area. Since family ties were of overwhelming importance among Icelanders at the time, this suggests that Erik was born locally and had close relatives in the region.

A fourth reason is the possible misidentification of Erik with the northwest because of confusion concerning the name of his father and his father's farm. The man named Thorvald who is associated with Drangar in the north may *not* have been the father of Erik. In the *Book of Settlements* there is mention of another Thorvald, one connected with Ingolf the Strong, who settled at Breidafjord, and it may have been this Thorvald who was Erik's father. Furthermore, like numerous place names in Iceland, Drangar is applied to more than one locality. There is a Drangar on the Hornstrands and also one at Breidafjord. As Erik became increasingly famous because of the success of the Greenland colony, the text about him in the *Book of Settlements* may have been expanded, and possibly it was then that Erik's name was added to the reference concerning Thorvald and Drangar in the north. Despite the confusion of the record, Ari's statement in the *Book of Icelanders* that Erik was "a man from Breidafjord" and Halldorsson's arguments supporting this interpretation are accepted in the following reconstruction of the early years of Erik's life.

The identification of sites associated with Erik is based on verbal tradition as well as on written sources. The veracity of this information is impossible to prove without extensive archaeological excavations, but it can be defended in two ways. First, the record of events occurring during Erik's life in Iceland after his marriage is considered accurate by historians. Second, contemporary Icelanders have a profound appreciation of their past and a keen interest in recounting local traditions. This seems especially true of people living on isolated farmsteads associated with memorable historical events. Farmers at localities identified with Erik the Red speak in detail about the significance of particular spots associated with him. These people also are intimately familiar with published descriptions applying to their locality, indicating an interest in history that probably has existed since the Middle Ages. The following account about Erik's life in Iceland and the sites associated with him includes written information combined with verbal folk history in what seems to be a resonable synthesis.

During the Age of Settlement a Norse man named Thorvald settled in western Iceland on the northern coast of Snaefellsness Peninsula, claiming Drangar and the adjacent islands, which were especially valued as pasture for stock in the summer. His brother Ingolf the Strong had claimed and settled the land directly to the east. Erik, born about 950, was reared at Drangar and about 970 married Thjodhild, the daughter of Thorbjorg Ship-Breast, whose husband at the time was

In retaliation for the landslide on Valthjof's farm, a relative of Valthjof's, Eyjolf Saur, killed Erik's slaves, who were responsible for the slide. These killings occurred at Skeidsbrekkur, near the abandoned sheep shed in the foreground.

Thorbjorn of Haukadale, a valley about twenty miles east of Drangar. Erik received land in Haukadale from his father-in-law and lived there, at Eriksstead, for about five years; Leif presumably was born during this time. The ruin identified as Eriksstead, a comparatively small, rectangular remains of a dwelling, was excavated repeatedly, but no artifacts were recovered in association with the structure.

While living at Haukadale, Erik became embroiled in a series of conflicts that led ultimately to the Greenland voyages. The particulars are so detailed in the *Book of Settlements* that it seems the writer was intimately familiar with the events described. According to his account, the conflict began when Erik's slaves launched a landslide onto the farm of a man named Valthjof. Located across the valley from Eriksstead, the site of the original farmhouse at Valthjofsstead still could be identified in 1987 by the residents of an adjacent farm. The landslide is described in the *Book of Settlements* as being launched "onto the farm," which has been interpreted to mean onto the farmhouse. However, this source does not state that the dwelling itself was struck by the landslide. If the identification of the house site is correct, the landslide could not have reached it, since it is far from the hills behind. If there was a little actual damage, Erik may have been angered justifiably by what happened next.

In retaliation for the damage to the farm, Eyjolf Saur, a kinsman of Valthjof's, killed Erik's slaves at Skeidsbrekkur, near Eriksstead. Erik retaliated by killing Saur at his farm, Saurstadir. According to the present-day residents of this farm, Erik and Saur fought at a grassy spot east of the modern farmhouse. In another fight Erik killed Dueller-Hrafn, who lived at Leikskalar, another farm in the valley. As a result of these killings Erik was banished, apparently at a meeting of the local assembly.

Leaving Haukadale, Erik returned to the Drangar area in which he had grown up, but with his enemies so near at hand he prudently settled on an island, South Island, about two miles northwest of Drangar. For a year he lived on this island at Tradir, which means a

After Eyjolf Saur killed Erik's slaves, Erik fought and killed Eyjolf at Saurstadir. The killings reportedly took place on the area in the foreground. This was one of two murders that led to the banishment of Erik from Haukadale and the first major step in the sequence of events leading to his discovery of Greenland.

It was at Leikskalar, the site of this modern farm, that Erik killed Dueller-Hrafn. This second killing led to Erik's expulsion from Haukadale. ➧

After Erik took his bench-boards back from Thorgest, Thorgest pursued him, and they fought near Drangar, which takes its name from the monolithic rocks in the background. Here two of the sons of Thorgest and some other men were killed, which led to Erik's sentence as an outlaw and his departure from Iceland.

"path" or "trail," and in this sector commonly refers to a passage through a hayfield. While living there, Erik lent his bench-boards to Thorgest, who lived at Breidabolstead, the farm directly east of Drangar. Bench-boards seem to have been parts of benches or sleeping compartment dividers; in either case they were elaborately carved and valuable family possessions. This loan soon would lead to further conflict.

It may have been about this time, when Erik was friendly with Thorgest, that he built a smithy near the eastern boundary of the Drangar farm and within sight of Thorgest's home at Breidabolstead. In Iceland, as in southern Norway and later in Greenland, iron was smelted from the bog iron found on many farms. Bog iron is a form of iron ore found in swampy areas where rocks containing iron minerals have been exposed to long-term weathering. Once smelted the iron could be used for tools, weapons, nails, and rivets. The ruin of what is reported to have been Erik's smithy is still distinctly visible, presumably because the solid ground beneath the foundation has prevented the walls from sinking.

The following year Erik moved to a larger island to the north, Oxney, and founded a secord farm called Eriksstead. The ruin that long has been identified as the remains of Erik's home on this island is on a prominent rise that overlooks an inlet to the north, the surrounding islands, the passages between the islands, and an expanse of low land on Oxney itself. It is thought by local people, as recounted by Johann Jonasson, who was born on Oxney, that Erik selected this site because of the commanding view of incoming vessels as well as overland intruders. The ruins of three boathouses or fishermen's shacks belonging to Erik were reported visible on the shores of the adjacent inlet, Eriksvogur, in 1817, but they could not be found in 1987.

When living on Oxney, Erik asked Thorgest to return the borrowed bench-boards, but to no avail. Erik, accompanied by his supporters, went to Breidabolstead and retrieved the boards. Thorgest, his sons, and others formed a party that pursued Erik's group, and they fought near the farm at Drangar, where two of Thorgest's sons and other men were killed. After this skirmish Erik and Thorgest kept their allies near at hand, but no further fighting is reported. The next episode occurred when Thorgest took his grievance to the

Modern Breidafjord, at the end of a long day in spring, probably appeared much the same when Erik the Red left Iceland after being banished from there for three years.

local Thorsness Assembly; here Erik and his men were judged outlaws, probably at the level called "lesser outlaw." In the Icelandic legal system at this time, declaring a person a lesser outlaw meant he must forfeit his property and be banished from Iceland for three years. Aided by friends, Erik hid on the island of Dimunarklakkar in northwest Breidafjord until he was adequately prepared to leave. Of all the islands of Breidafjord this one is the most prominent. Its two striking cliffs, or *klakkar,* are the highest points on any islands in the fjord and could have screened Erik's ship as well. As Thorgest and his allies searched for him, Erik made hasty preparations to sail in the direction of small islands called the Gunnbjorn Skerries. On a voyage from Scandinavia to Iceland about 900, Gunnbjorn reportedly had been driven off course and had sighted skerries, or rocky islands, west of Iceland. Whether these were islands off the eastern coast of Greenland, a mirage, or floating ice is not known. Irrespective of what the sightings may have been, lore about them persisted, and Erik hoped to find them when he sailed out of Breidafjord and to the west.

Erik coursed westward until he sighted the east coast of Greenland. He considered the region uninviting and sailed on, rounding Cape Farewell and exploring the fjords in the southwestern sector. Continuing to explore during the summers, he wintered at three different localities before returning to Breidafjord, where he stayed with a friend the following winter. Again Erik had problems with his old adversary Thorgest, but after battling once more, they reconciled their differences. Nonetheless, Erik resolved to return to the land he had explored and now named "Greenland," hoping to induce others to settle there with him. During the summer of 985 or 986, according to the traditional chronology, numerous settlers sailed off with Erik and Leif to colonize Greenland. So ends Erik the Red's life in Iceland. For the next thirty years he lived in Greenland, where he died about 1015.

Erik's bloody conflicts in Iceland were compared to those of many of his contentious contemporaries, but his first sailing was a daring, even a desperate, response to the sentence of outlawry. More importantly, he explored and settled what was a new world, not only to this bold Icelander but to all Europeans at that time. It is little wonder that he became the subject of a memorable literary work, the *Saga of Erik the Red,* written by Icelanders in medieval times and still popular today. **FM**

SUGGESTED READINGS

Erik the Red and other Icelandic Sagas, by Gwyn Jones. Oxford University Press, 1980.

Northern Sphinx, Iceland and the Icelanders from the Settlement to the Present, by Sigurdur Magnusson. McGill-Queen's University Press, 1977.

Distilling the Truth About Ethanol

by Larry Dombrowski

Ethanol has been used as a fuel since the invention of the internal combustion engine. Ethanol-blended fuel, which consists of 10 percent ethanol and 90 percent gasoline, has been used by Americans to travel many billions of miles since the fuel was introduced about a decade ago. Despite its long history, ethanol remains one of the most controversial of all transportation fuels in terms of consumer acceptance, economics, and energy security.

Even though the market share for ethanol blends in Iowa is more than 30 percent, there is a substantial number of motorists in that state who believe that ethanol blends are inferior to straight gasoline. The most common complaints include starting problems and engine pinging and knocking. In most cases, these problems can be attributed to the clogging of the fuel filter, which may occur in older vehicles. Ethanol is a solvent, cleaning dirt and grime that normally accumulates in vehicles using straight gasoline. When these residues break loose, they are captured in the vehicle's fuel filter. Clogging of the filter prevents the normal flow of fuel from being supplied to the engine; thus, problems with starting or engine pinging may occur. Once the dirty filter has been changed, the vehicle may actually experience improvement in performance, due to a cleaner engine and fuel system.

The Colorado Department of Health recently completed a "blind" study on the performance characteristics of ethanol blends and gasoline. The study used data collected from approximately 2,500 vehicles covering 3.6 million miles. The vehicle model years ranged from 1960 to 1987. The drivers participating in the study did not know if an ethanol blend or straight gasoline was being used in their vehicles. The fuels were rotated so that each driver drove with both ethanol blends and gasoline in their tanks. Drivers were asked to rate driveability, cold starting, engine pinging, and general driver satisfaction. Results of the study showed that no drivers reported any type of engine damage and 90 percent of the drivers rated ethanol blends and gasoline as equally "satisfactory."

Consumers are slowly beginning to view ethanol blends as a superior fuel. Ethanol has traditionally competed in the transportation fuels market as a gasoline extender. Ethanol is now being marketed for its value as an octane enhancer. By blending 10 percent ethanol with 90 percent gasoline, the octane rating of the fuel will be approximately three octane points higher than straight gasoline. With many automobile manufacturers producing high performance vehicles that recommend using higher octane mid-grade or premium gasoline, ethanol's demand as an octane booster is expanding.

Ethanol is also gaining support as a fuel which reduces air pollution. Ethanol use can help meet certain requirements of the Clean Air Act. The use of ethanol blends significantly reduces carbon monoxide emissions. Carbon monoxide is a colorless, odorless, tasteless, and poisonous gas. More carbon monoxide is emitted into the atmosphere each year than any other pollutant. Currently, more than 70 urban areas in the U.S. fail to meet the Clean Air Act standards for carbon monoxide levels established by the Environmental Protection Agency (EPA).

A growing number of state and local government agencies are considering the mandated use of fuels such as ethanol to meet EPA's standard for carbon monoxide levels. Tests conducted by the EPA have shown that ethanol blends reduce carbon monoxide emissions in a vehicle by 10 to 30 percent, depending on the fuel combustion technology of the vehicle. The Front Range Area in Colorado, which includes Denver, has successfully mandated a program to limit emissions of carbon monoxide. Ethanol blends play a prominent role in Colorado's strategy to improve the environment.

The benefits achieved by reducing carbon monoxide levels with ethanol blends may be somewhat offset by increases in nitrogen oxide and hydrocarbon emissions. The reaction of nitrogen oxide and hydrocarbons in the presence of sunlight yields ozone. Use of ethanol blends tends to increase ozone concentrations, which are also limited by the Clean Air Act. Ethanol increases the volatility, or the ease of which a liquid is converted into a gaseous state, of the base gasoline, potentially releasing gases into the atmosphere

---

"Distilling the Truth about Ethanol" is reproduced from *Iowa Conservationist*, with minor emendations. Courtesy Iowa Department of Natural Resources. Larry Dombrowski is a research analyst for the department's energy bureau.

that increase ozone concentrations. Ozone, however, is a summer problem, whereas carbon monoxide is a winter problem, allowing seasonal blending of ethanol to reduce carbon monoxide emissions without increasing ozone problems.

The ethanol fuel industry was created by a mix of federal and state subsidies, loan programs, and incentives in response to our desire to become more energy-secure after the "energy crisis" of the 1970s. Ethanol production accounts only for less than one-tenth of one percent of U.S. energy, but ethanol production still has value as one component of a total alternative energy package to reduce our dependency on imported energy.

The ethanol industry has been able to grow and compete with gasoline because ethanol blends are exempt from six cents of the federal gasoline excise tax, and in Iowa, for example, from one cent of the state gasoline excise tax. Since 10 gallons of an ethanol blend has one gallon of ethanol and nine gallons of gasoline, this translates into a direct subsidy of 70 cents for every gallon of ethanol sold in Iowa. The economic interplay of gasoline and ethanol prices is of paramount importance. For example, with today's wholesale price of gasoline at 35 cents per gallon ethanol will be a competitive product up to a price of $1.25 per gallon. Without tax exemptions for ethanol, crude oil prices would have to increase to at least $40 per barrel, with corn prices below $2 per bushel, for ethanol producers to survive. Currently, a barrel of crude oil is selling for around $16.

Federal and state gasoline tax exemptions for ethanol-blended fuel directly reduce highway trust fund revenues. For every gallon of ethanol sold in the U.S., federal highway funds decline by six cents. In 1987, 8.5 billion gallons of ethanol blends were sold in the U.S., reducing federal revenues by $510 million.

Since ethanol production reduces both federal and state highway funds and has a limited role in energy security, why do many national and state policy makers continue to support the ethanol industry? As previously discussed, ethanol has positive social benefits by helping to reduce certain pollutants in urban areas. But ethanol production also has positive economic benefits. Ethanol production affects both the supply and demand for corn. The demand for corn increases because ethanol production creates additional markets for corn. Increases in demand lead to higher corn prices. According to a Purdue University study, the 1985 price of corn was 10 cents per bushel higher than it would have been without domestic ethanol production. The production of ethanol increased the value of Iowa's 1986 corn crop by $160 million.

Increases in ethanol production decrease federal farm program costs by raising corn prices. Expanded corn markets created by the ethanol industry can partially substitute for more traditional agricultural programs which have relied on price supports, supply controls, and grain reserve programs to reduce excess domestic supplies.

Technical and public policy developments will continue to strenghten ethanol's role as a fuel in the future. The U.S. House of Representatives recently passed a bill which contains incentives designed to promote the production and use of vehicles that run on alternative fuels.

The main provision of the bill relaxes the federal government's Corporate Average Fuel Economy (CAFE) standards. The standards require that the average fuel efficiency of all the automobiles produced by a single automaker meet a certain level. The current standard is 26 miles per gallon. Cars designed to run primarily on methanol, ethanol, or compressed natural gas would have CAFE ratings based on the amount of gasoline they use. This would mean that a vehicle getting 40 miles per gallon on an ethanol blend with a 15 percent gasoline content would get a CAFE rating of 133 miles per gallon.

Another provision of the bill requires that the federal government buy as many alternative fuel vehicles as possible. Federal agencies would be offered incentives to purchase these vehicles.

The bill would also require that the public be able to purchase alternative fuels at selected government facilities. This helps to eliminate the "chicken and egg" problem that has slowed the introduction of alternative fuel vehicles. Consumers are reluctant to buy alternative fuel vehicles because it's hard to find fuel for them. Service stations are reluctant to stock alternative fuels because there is little demand for those fuels.

New applications for ethanol fuels are promising. U.S. automakers are now beginning to produce flexible-fuel vehicles. Flexible-fuel vehicles are capable of running under any combination of ethanol or gasoline. These vehicles have an optical fuel sensor which determines the percentage of ethanol in the fuel and signals a control computer which automatically adjusts the fuel injection system and ignition timing to compensate for different blends of ethanol and gasoline without driver interaction. The flexible-fuel concept is valuable because it allows for the growth of ethanol-capable fleets without imposing unacceptable limits in usability or range of the vehicles when ethanol refueling facilities are not widely available. Thus, if a flexible-fuel vehicle were traveling across the state of Iowa, the driver could fill up the tank with ethanol in Waterloo and then refill the tank with gasoline in Ames without ever having to adjust or modify any part of the vehicle.

The production of ethanol may never reach the expectations bestowed upon the industry at its inception in the 1970s. However, ethanol will continue to be a part of the nation's energy picture as we strive to implement renewable domestic energy alternatives to replace unstable foreign supplies.

FIELD MUSEUM TOURS

Kenya/Tanzania Safari

March 3-23, 1989

Leader: Audrey Joy Faden

Price: $6,350

ITINERARY

March 3
Fly from Chicago to London via British Airways.

March 4
Fly from London to Nairobi, Kenya. Day rooms in London. Evening flight to Nairobi.

March 5
Nairobi. City tour. Welcome cocktail party and dinner.

March 6
Nairobi/Amboseli National Park, justly famous for its big game and superb views of Mt. Kilimanjaro. Afternoon lecture by local researcher. Late afternoon game drive.

March 7
Amboseli National Park. Morning and afternoon game drives. Mid-day at leisure to relax at the lodge or swim in the pool.

March 8
Amboseli National Park/Namanga/Gibb's Farm, Tanzania. Cross the border, where we clear customs before proceeding into Tanzania to Gibb's Farm, where the remainder of day is at leisure.

March 9
Gibb's Farm/Serengeti National Park. Game drives in the Ngorongoro Conservation Area and the Serengeti.

March 10
Serengeti National Park. Full day exploring this vast area.

March 11
Serengeti National Park/Olduvai/Ngorongoro Crater. Visit Olduvai Gorge and the site of Louis and Mary Leakey's discovery of *Zinjanthropus bosei*. Continue on to the spectacular Ngorongoro Crater.

March 12
Ngorongoro Crater. Full day down in the crater, tracking and photographing the animals.

March 13
Ngorongoro Crater/Lake Manyara National Park. Depart to Lake Manyara Hotel, set in lovely gardens with a swimming pool overlooking the park. Optional activities.

March 14
Lake Manyara National Park. Morning and afternoon game drives, exploring the diversity of this park.

March 15
Lake Manyara National Park/Namanga, Kenya/Nairobi. Drive back to Arusha for lunch and continue on to the Namanga border, clear customs and return to Nairobi.

March 16
Nairobi/Aberdare National Park/The Ark. This morning you proceed into deep forested area alive with some of the finest game viewing in Kenya. After lunch at Aberdare Country Club transfer to The Ark, "berthed" over a waterhole where the animals come to drink. From a ground-level lounge with large picture windows, you have an eye-to-eye view of this constantly changing scenario.

March 17
Aberdare National Park/Samburu Game Reserve. This reserve is home to several species found only in these northern areas.

March 18
Samburu Game Reserve. Your game viewing takes you through a variety of landscapes. Bird enthusiasts will be well rewarded with over 300 species, including the martial eagle, in this reserve.

March 19
Samburu Game Reserve/Mount Kenya Nanyuki. Drive to the famous Mt. Kenya Safari Club. The grounds cover 100 acres of blooming flower beds, ponds with water lilies and stands of shade trees—a litoral oasis in the middle of the African bush.

March 20
Mount Kenya Nanyuki/Nairobi/Masai Mara Game Reserve. Drive back to Nairobi and after lunch depart on the afternoon flight to the Masai Mara Game Reserve, where we'll stay in a luxury safari camp.

March 21
Masai Mara Game Reserve. Enjoy a day of game viewing in the Mara, one of the last strongholds of the great herds.

March 22
Masai Mara Game Reserve/Nairobi. After one last game run in the Mara, return to Nairobi by air. Remainder of day at leisure.

March 23
Nairobi/London/Chicago. Midnight flight to London on British Airways. Connect to British Airways to Chicago, arriving later the same day.

Antarctica

Discovering Antarctica, the Strait of Magellan, Tierra del Fuego, and Cape Horn aboard the *Illiria* under the leadership of Dr. Bruce D. Patterson, associate curator and head of the Division of Mammals at the Field Museum of Natural History.

February 20-March 7, 1989

Pre-Cruise Extension to Patagonia and the Lake District

February 15-23, 1989

The Galapagos

Aboard the m. v. *Santa Cruz*

March 3-14, 1989

Optional Extension to Peru March 14-20

Price: $3,550-$3,840

March 3: Chicago/Miami/Quito. Welcome party and orientation.
March 4: A full day excursion to the colorful Indian fair of Otavalo.
March 5: All-day birding excursion up into the mountains outside Quito.
March 6: Fly to Guayaquil and on to Baltra where we board the *Santa Cruz*.
March 7: Cruising—Bartolome and Tower Islands.
March 8: Cruising—Isabela and Fernandina Islands.
March 9: Cruising—North Seymour Island.
March 10: Cruising—Hood and Floreana Islands.
March 11: Cruising—Santa Cruz and Plaza Islands.
March 12: Cruising—James Island.
March 13: This morning we cruise to Baltra, disembarking to board our flight to Guayaquil. Farewell dinner.
March 14: Return flight to Chicago.

Join us as we explore one of the world's greatest living laboratories of natural history under the leadership of Dr. David E. Willard, collection manager of the Bird Division of the Field Museum of Natural History. The Galapagos Islands—birthplace of Darwin's "Origin of Species"—situated 600 miles off the coast of Ecuador, remain remote and out of the elements of nature where an abundance of strange creatures known nowhere else on earth reside. An optional trip to Peru at a cost of $1,450 includes visits to the world-famous site of Machu Picchu, Lima, and Cuzco.

For reservations, call or write Dorothy Roder (322-8862), Tours Manager, Field Museum, Roosevelt Rd. at Lake Shore Dr., Chicago, Il 60605

Field Museum of Natural History
Membership Department
Roosevelt Road at Lake Shore Drive
Chicago, IL 60605-2499

MISS MARITA MAXEY
7411 NORTH GREENVIEW
CHICAGO IL 60626

FIELD MUSEUM OF NATURAL HISTORY BULLETIN

October 1988

Plan Now for Grand Opening of

"INSIDE ANCIENT EGYPT"

Coming November 11

Field Museum of Natural History Bulletin

Published since 1930 by
Field Museum of Natural History
Founded 1893

Editor/Designer: David M. Walsten
Production Liaison: Pamela Stearns
Staff Photographer: Ron Testa

BOARD OF TRUSTEES

Robert A. Pritzker
Chairman
Mrs. T. Stanton Armour
George R. Baker
Robert O. Bass
Gordon Bent
Mrs. Philip D. Block III
Willard L. Boyd,
President
Robert D. Cadieux
Worley H. Clark
James W. Compton
Frank W. Considine
William R. Dickinson, Jr.
Thomas E. Donnelley II
Thomas J. Eyerman
Marshall Field
Ronald J. Gidwitz
Clarence E. Johnson
Richard M. Jones
John James Kinsella
Robert D. Kolar
Hugo J. Melvoin
Leo F. Mullin
James J. O'Connor
Mrs. James J. O'Connor
James H. Ransom
John S. Runnells
Patrick G. Ryan
William L. Searle
Robert H. Strotz
Mrs. Theodore D. Tieken
E. Leland Webber
Blaine J. Yarrington

LIFE TRUSTEES

Harry O. Bercher
Bowen Blair
Stanton R. Cook
Mrs. Edwin J. DeCosta
Mrs. David W. Grainger
Clifford C. Gregg
Mrs. Robert S. Hartman
Edward Byron Smith
John W. Sullivan
J. Howard Wood

CONTENTS

October 1988
Volume 59, Number 9

OCTOBER EVENTS AT FIELD MUSEUM 3

LIFE AND TIMES OF THE DINOSAURS
By Dale A. Russell 8

FIELD MUSEUM TOURS 30

COVER

Amateur paleontologist Watie White seems daunted by the two bones looming over him. Perhaps he has been told that they come from an animal's backbone and he hasn't yet come to terms with that idea. The bones are in fact vertebrae from the dinosaur *Brachiosaurus altithorax*, found by Field Museum curator Elmer S. Riggs near Grand Junction, Colorado, in 1900. At that time, *Brachiosaurus*, at an estimated 85 tons, was king of the dinosaurs—far larger than its better known, 35-ton cousin, *Apatosaurus* (a.k.a. *Brontosaurus*), whose skeleton is the centerpiece of Field Museum's Dinosaur Hall. Young Watie had access to the bones in a special storage area as son of staff member John White (then coordinator of Field Museum's Native American Program). Though Watie has grown some since the photo was taken in 1974, it is unlikely that he is big enough to heft these gigantic bones, now turned to stone. For more on dinosaurs see Dr. Russell's discussion of them, "Life and Times of the Dinosaurs," beginning on page 8. Photo by D. Walsten.

VOLUNTEER AT FIELD MUSEUM

Learn something new or share your expertise—a wide variety of challenging and rewarding volunteer opportunities for either weekdays or weekends are currently available. Please call the Volunteer Coordinator at (312) 922-9410, extension 360, for more information.

Field Museum of Natural History Bulletin (USPS 898-940) is published monthly, except combined July/August issue, by Field Museum of Natural History, Roosevelt Road at Lake Shore Drive, Chicago, IL 60605-2496.

Copyright ©1988 Field Museum of Natural History.

Subscriptions: $6.00 annually. $3.00 for schools. Museum membership includes *Bulletin* subscription. Opinions expressed by authors are their own and do not necessarily reflect the policy of Field Museum. Unsolicited manuscripts are welcome. Museum phone: (312) 922-9410. Notification of address change should include address label and be sent to Membership Department. Postmaster: Please send form 3579 to Field Museum of Natural History, Roosevelt Road at Lake Shore Drive, Chicago, IL 60605-2496. ISSN: 0015-0703.

EVENTS

ADULT COURSES

Indian History of the Western Great Lakes

Tuesdays, 7:00pm-9:00pm
October 4, 11, 18, 25

The Indian History of the Western Great Lakes series continues through October. Each weekly session may be registered for individually. $10/session ($8 members). To register, use the coupon

☐ *October 4*

Frontier In Transition (AC88302-B)
Helen Hornbeck Tanner, Historian, D'Arcy McNickle Center for the Study of the American Indian, Newberry Library

EUROPEAN SETTLEMENT had a powerful influence on the social, economic, and political structures of Indian societies. As Europeans moved down the Ohio River and then northward through Ohio and Indiana, they pushed the frontier northward disrupting the inner-tribal balance among the Indian communities. The impact on Indians of the French and Indian War, the American Revolutionary War, and the War of 1812 is also discussed.

☐ *October 11*

The Black Hawk War and the Removal Period (AC88302-C)
Nancy O. Lurie, Curator of Anthropology, Milwaukee Public Museum

BLACK HAWK'S SURRENDER to American soldiers marked the end of Indian-held land in Illinois. It also increased the forced removal of Indians from the Western Great Lakes territories. Discuss the events surrounding the Black Hawk War and its impact as a turning point in the political struggles of Indian people.

☐ *October 18*

Distilled Knowledge in Indian Legends (AC88302-D)
Keewaydinoquay, Elder of the Anishnabeg, Ph.D. Candidate, Department of Botany, University of Michigan

FOR YEARS, scholars have dismissed oral history as an unimportant and unreliable source for use in the study of history. But today, historians, ethnohistorians, and anthropologists are becoming more aware of how oral traditions function as a valuable depository of information for the history, culture, and ethics of a given society. Once seen as juvenile folktales, the oral history of Western Great Lakes Indians is now being recorded and evaluated for its historical accuracy, literary merit, and most importantly, for its spiritual and philosophical meaning for both Indian and non-Indian people.

☐ *October 25*

Chicago's Indian Community—1950 to the Present (AC88302-E)
Dorene Wiese, Dean of Administration, Truman College

CHICAGO'S INDIAN COMMUNITY is one of the largest and most influential Indian communities in the United States. Its history and growth is typical of what occurred in other large urban centers in the midwest. Due to economic factors and to the dubious Relocation Program instituted by the Federal Government in the 1950s, many Indians came to the cities for employment and educational opportunities. Discussion focuses on the recent history and issues that face Chicago's diverse Indian community.

Continued ▷

ADULT COURSES

Registration

Be sure to complete all requested information on this registration application. Adult course advance registrations are confirmed by mail. For registrations received less than two weeks before the class begins, confirmations are held at the West Door on the first night of class. Phone registrations are accepted for adult courses using Visa/MasterCard/Amx/Discover. Please call (312) 322-8854 to register. For further registration information, consult the September/October Adult and Family Program Brochure.

Return complete registration with a self-addressed stamped envelope to:

Field Museum of Natural History
Department of Education, Adult Programs
Roosevelt Road at Lake Shore Drive
Chicago, IL 60605-2497

Name _____

Address _____

City _____ State _____ Zip _____

Telephone: Daytime _____ Evening _____

☐ Member ☐ Nonmember

American Express/Visa/MasterCard/Discover

Card Number _____

Signature _____ Expiration Date _____

Program	#Member Tickets	#Nonmember Tickets	Total Tickets	Amount Enclosed
Indian History AC88302-B				
Indian History AC88302-C				
Indian History AC88302-D				
Indian History AC88302-E				
			Total	

☐ Scholarship requested

EVENTS

AFTER HOURS: FILMS AT THE FIELD

Fridays, October 7-14
West Entrance

Free!

Two Chinese films are featured in October as Field Museum continues its series of films from around the world. Light fare and beverages are available beginning at 4:30pm at the After Hours Cafe. Films begin at 6:00pm. For more information call (312) 322-8854.

☐ *October 7*
"Yellow Earth"
1984. 94 minutes. Color. China.
Director: Chen Kaige
Mandarin Chinese with English subtitles.

SET IN THE STEPPES of China's northern provinces in the late thirties, a young soldier in Mao's army visits a remote village as he collects folksongs. In the village he is put in with one of the poorest families, a taciturn widower and his teenage daughter and son. The daughter is to be sold into marriage with a much older man and the soldier's talk of breaking with feudal tradition fills her with unrealistic hopes of escape. *Yellow Earth* is the first film of a new Chinese cinema with its roots in Chinese painting and music, and not the formula propaganda of the last three decades.

☐ *October 14*
"Black Cannon Incident"
1985. 107 minutes. Color. China.
Director: Huang Jianxin
Mandarin Chinese with English subtitles.

TYPICAL of the new direction in Chinese filmmaking, *Black Cannon* deals with subjects and issues not seen before in Chinese films. This farce is about a misplaced chess piece. And when its owner, a well-educated engineer, attempts to find it by sending a telegram, the operator suspects it is a secret code, and here the farce begins.

Yellow Earth
coming October 7

EVENTS

EDWARD E. AYER SERIES

THE EDWARD E. AYER LECTURE SERIES continues Thursdays through October beginning October 6, 1:30pm, James Simpson Theatre. Lectures are free and refreshments are served.

☐ *October 6*
"Chinese Gardens"
Taimi Anderson, Landscape Architect
FROM THE EARLIEST HUNTING PARKS of the Han Dynasty emperors to the elegant Ming Dynasty city gardens, rocks and water are essential ingredients in Chinese gardens. Red lacquered columns, towering rockeries, still pools, and flowers combine to make gardens of tranquil beauty.

☐ *October 13*
"Inca Myth and History"
Brian Bauer, Ph.D. Candidate, Anthropology Department, University of Chicago
INCA MYTH holds that the first mythical ruler of the Incas, Manco Capac, came from a region south of Cuzco, Peru. Recent archaeological investigations in the area have uncovered a temple and cave complex dedicated to this sacred figure. Look at the Inca origin myth and the area's archaeological ruins where myth meets history.

☐ *October 20*
"Ancient Egypt"
Frank Yurco, Ph.D. Candidate in Egyptology, Department of Near Eastern Languages and Civilizations, University of Chicago
TRAVEL BACK to the land of pharaohs and pyramids. Delve into Egypt's mysterious and glorious past with a look at ancient religion, economy, and politics. Prepare yourself for a visit to Field Museum's new exhibit on Ancient Egypt, opening November 11.

☐ *October 27*
"Traditional Art of Africa"
Ramona Austin, Assistant Curator for African Art, Department of Africa, Oceania and the Americas, The Art Institute of Chicago
TRADITIONAL AFRICAN ART speaks a rich and varied language. Increase your appreciation by examining representative works. Learn to identify recurring symbols and understand the place of art in traditional African society.

WEEKEND PROGRAMS

Each Saturday and Sunday you are invited to explore the world of natural history at Field Museum. Free tours, demonstrations, and films related to ongoing exhibits at the Museum are designed for families and adults. Listed below are some of the numerous activities offered each weekend. Check the activity listing upon arrival for the complete schedule and program locations. The programs are partially supported by a grant from the Illinois Art Council.

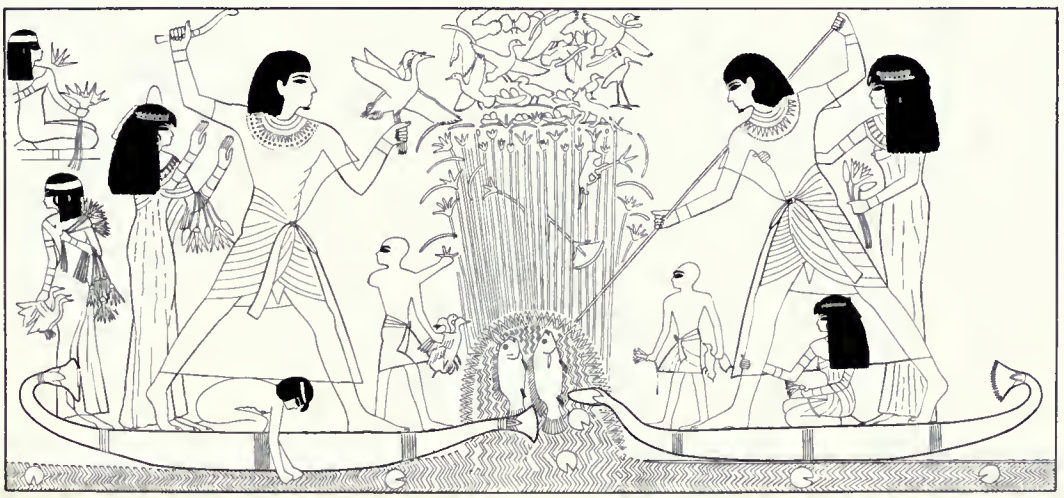
October

15 12:30pm *Surprise Safari*
Trek through the four corners of the Museum to see the seven continents. See antiquities from the Amazon, big game from Africa and seals from the Arctic.

22 1:30pm *Tibet Today and Tour of Collection*
See Lhasa and other towns now open to tourist, then take a tour of our Tibetan exhibit (slide lecture and tour).

29 12:30pm *Surprise Safari*
Trek through the four corners of the Museum to see the seven continents. See antiquities from the Amazon, big game from Africa and seals from the Arctic.

These programs are free with Museum admission and tickets are not required.



NO EASY ROSES

A Look at the Lives of City Teenagers

Opens Saturday, Oct. 22
Closes Sunday, Nov. 27

"NO EASY ROSES: A Look at the Lives of City Teenagers" features photography and video by Olive Pierce, a high school teacher in Cambridge, Massachusetts during the late 1970s. Pierce set out with a camera and tape recorder, roaming the hallways, locker rooms, and social events that constitute the "world of school." Her photography captures the "hidden places" that exist in all schools and reflects many of the emotional dramas that characterize adolescence. The exhibit was developed in conjunction with Pierce's book, also titled "No Easy Roses." She hopes her work will carry adult viewers back to their own adolescence and provide additional understanding of this age group.

"Glynis and Natasha"
by Olive Pierce
©1986
from "No Easy Roses"

DARK LADY DREAMING

"The Power of Women"
Quilt by Amy Cordova

QUILTS and DRAWINGS by AMY CORDOVA

Closes Sunday, Nov. 13

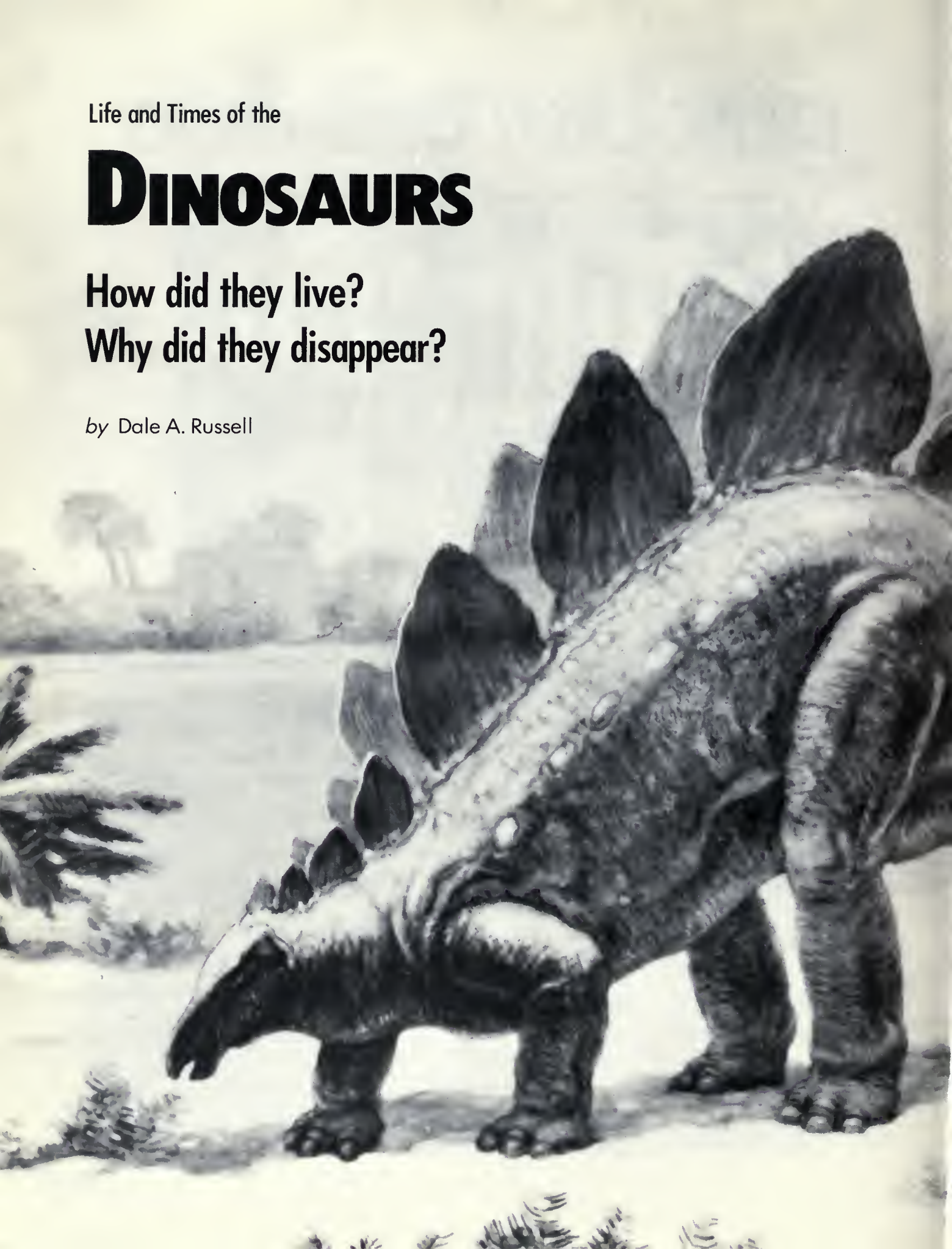
MODERN "quilt paintings" and oil pastel drawings are featured in this unusual, vibrant collection of work by Amy Cordova. While some of Ms. Cordova's quilts represent traditional Amish patterns and designs, others incorporate original images that confront important human issues. The drawings depict some of life's ironies with explosive energy and a witty, abstract quality. Both the quilts and drawings flaunt a spectrum of brilliant colors such as magenta, peacock blue, and deep, rich green. Ms. Cordova views herself as a visionary and dreamer, committed to telling the truth and celebrating life all along the way.

Life and Times of the

DINOSAURS

How did they live?
Why did they disappear?

by Dale A. Russell



Painting of the dinosaur *Stegosaurus* as it may have appeared in its natural habitat, by Charles R. Knight. This painting and 27 others by Knight are on view as murals in Hall 38 (Hall of Dinosaurs). They were executed between 1927 and 1931. See pages 12 and 20 for other Knight murals. CK63225

THE AGE OF REPTILES BEGAN with the Triassic period, about 250 million years ago, when a great variety of reptiles that resembled bizarre crocodiles or reptiles possessing a peculiar mixture of reptilian and mammalian characteristics were abundant on all of the continents. We call the former "false crocodiles" and the latter "mammal-like reptiles." Even where dinosaurs are known to occur in Triassic strata their remains are usually very rare. Dinosaurs became extinct at the end of the Cretaceous Period 65 million years ago. But their extinction didn't quite bring the age of reptiles to a close. Crocodiles, turtles, and the extinct gavial-like champsosaurs were the largest animals on land for several millions of years more, before some of the surviving mammals became large.

What did an ancestral dinosaur look like? They were small crocodile-like animals which differed from other so-called "false crocodiles" in having a bird-like ankle joint, in having more than two elements, or vertebrae, in their backbone supporting their hips, and in their manner of walking upright on their two hind limbs. The two basic types of dinosaurs, those with bird-like hips and those with lizard-like hips, appeared at about the same time. Although the earliest known dinosaurs weighed no more than a kilogram, within a few million years relatively large dinosaurs had evolved.

The dinosaurs, became dominant animals on land more or less accidentally about 210 million years ago, after a major extinction even wiped out the false crocodiles and mammal-like reptiles. Lizard-hipped dinosaurs rapidly gave rise to two major evolutionary streams, one becoming the brontosaurs and the other the carnivorous dinosaurs and perhaps later the birds. Bird-hipped dinosaurs also diversified, then underwent a second major diversification when flowering plants spread over the planet in early Cretaceous time. During the dinosaurian era a gigantic super continent ruptured and the separate continental blocks slowly drifted apart. A globally uniform dinosaurian fauna was also separated into more or less distinct continental units which were inhabited by special dinosaurian faunas, just as when the dinosaurs were gone mammals separated into the distinctive faunas of Africa, South America, and Australia.

There is quite a bit of mystery in this history. For example, the false crocodiles seem to have disappeared in a brief, worldwide mass extinction similar to the one that later eliminated the dinosaurs. How was it that mass extinctions could first bring dinosaurs to worldwide dominance, then to worldwide destruction?

The Triassic fauna of the "false crocodiles" was dominated by four-legged animals. So is the modern mammalian fauna. It would have been easier to predict the body shapes of modern land animals from the shapes of Triassic land animals than from those of dinosaurs. And most of the work on ancestor-descendant relationships in vertebrates is based on Triassic and Cenozoic animals, with the funny-looking dinosaurs more or less locked in the closet. Or their skeletons are placed on display as something like freaks of nature. Was the dinosaurian era really an odd period in the history of land animals?

Why were dinosaurs so large? Being large certainly provides protection from hostile neighbors. It also provides protection from rapid changes in temperature. So far as we know all dinosaurs had naked skins. But in spite of this, the buildup of heat in the bodies of a big animal, even a giant turtle, effectively makes it warm-blooded. A big animal can retain its body heat during cool nights or rainy days. The colossal size of brontosaurs may have allowed them to feed on low-quality plant food. Relatively little heat would be given off in the process of digestion. It might have been dangerous for them to feed on rich or finely chopped-up food. Bacteria in their intestines would have shed heat and gas more rapidly in the process of digestion. Just imagine a brontosaur with gas problems. It would bloat the way that cows do when they feed on rich, young alfalfa shoots in the spring. Plant-eating dinosaurs with well-developed grinding teeth, such as duckbilled dinosaurs and horned dinosaurs, were smaller than the brontosaurs. Perhaps they had to be smaller so that they could get rid of the heat generated by the finely chopped-up food. The chewing dinosaurs were seldom larger than modern elephants and were never as large as some giant extinct rhinos. The rich food of the flesh-eating dinosaurs may have also prevented them from ever being much larger than elephants. You can see that size and

---

"Life and Times of the Dinosaurs" is adapted from "The Dinosaur and the Pollen Grain: A Case for Parallel Evolution," a paper delivered by Dale A. Russell at the Sixth International Palynological Conference in Calgary, Alberta, August 1984. Dr. Russell is curator of fossil vertebrates at the Museum of Natural Sciences, National Museums of Canada, Ottawa. At the time of this publication he was on an expedition to Mongolia. He has a book on the dinosaurs of North America in preparation.

William F. Simpson, chief preparator of fossil vertebrates, shown in 1980 with *Antarctosaurus* femur. Simpson was reassembling the 740-lb. bone, discovered in Argentina in 1924 in four pieces. On wall behind Simpson may be seen similar photo of earlier preparator, John B. Abbott, as he worked on same bone in 1926. *Antarctosaurus* lived some 70 million years ago.

Charles R. Knight mural (in Hall 38) showing (l. to r.) corythosaurs, ankylosaur (with spikes), and anatosaurs. CK74806

heat-retention problems are related. Big people suffer more when it's hot. Most dinosaurs were larger than most mammals because their metabolic rates were lower, and they didn't have to shed so much body heat.

The time of origin of flowering plants coincides with a major dinosaurian faunal change in the Northern Hemisphere. The most ancient flowering plants were evidently branching bushes that could easily repair damage caused by browsing animals. Did browsing dinosaurs destroy the saplings of trees so that the flowering bushes could spread into the old conifer forests? Or did the flowering bushes provide food for the browsing dinosaurs, thereby allowing the dinosaurs to flourish and diversify? Which came first, the bush-browsing dinosaurs or the plants on which they fed?

Dinosaurs have not been carefully studied for evidence of evolution. This may be partly because the dinosaurian era was a rather unusual period in the history of life on earth, and partly because it's hard work to collect, store, and study the skeletons. Usually dinosaurs are considered to have been a somewhat conservative group of organisms, and dinosaurs from a variety of different times have a tendency to be seen together in painted reconstructions of landscapes and in science fiction novels. If dinosaurs did inhabit the earth for 150 million years and really showed no evidence of evolution, they would have been very peculiar animals.

Dinosaurs were able to attain a respectable degree of what we might call skeletal finesse during the time they were on earth. Skeletal finesse means perfection of skeletal design from an engineering point of view. The combinations of skeletal parts often seem a bit odd. This is partly because primitive dinosaurs ran on their hind legs and only some of the later dinosaurs habitually walked on all fours. If you can imagine birds becoming flightless and re-adapting their wings for use on the ground, it might give you some idea of the evolutionary problems early dinosaurs had to solve. In spite of their bipedal ancestors, however, many dino-

saurs put their parts together in ways that rather closely resembled some living or recently extinct mammals. Resemblances also occur between unrelated dinosaurs living on different continents. The differences and similarities were probably comparable to differences and similarities between mammals living on different continents today. These phenomena are called mosaic and convergent evolution by paleontologists. They suggest that adaptive finesse does not happen by accident. It is selected for because finesse is more than ordinarily useful in the struggle for existence. In this sense evolution is a deterministic, not a random process.

About 140 million years ago, during late Jurassic time, relatively well-studied dinosaur faunas from China, Tanzania, and the United States resembled each other rather closely, both in the basic kinds of dinosaurs present and in the relative abundance of each kind. During the following Cretaceous Period the effects of continental drift and a cooling of the poles become obvious. This is very well documented in the pollen and spore record. What is known of the dinosaurian record seems to show the same kind of continental and latitudinal effects. It might be interesting to explore how dinosaurs and plants were affected by geography during late Cretaceous time, about 75 million years ago.

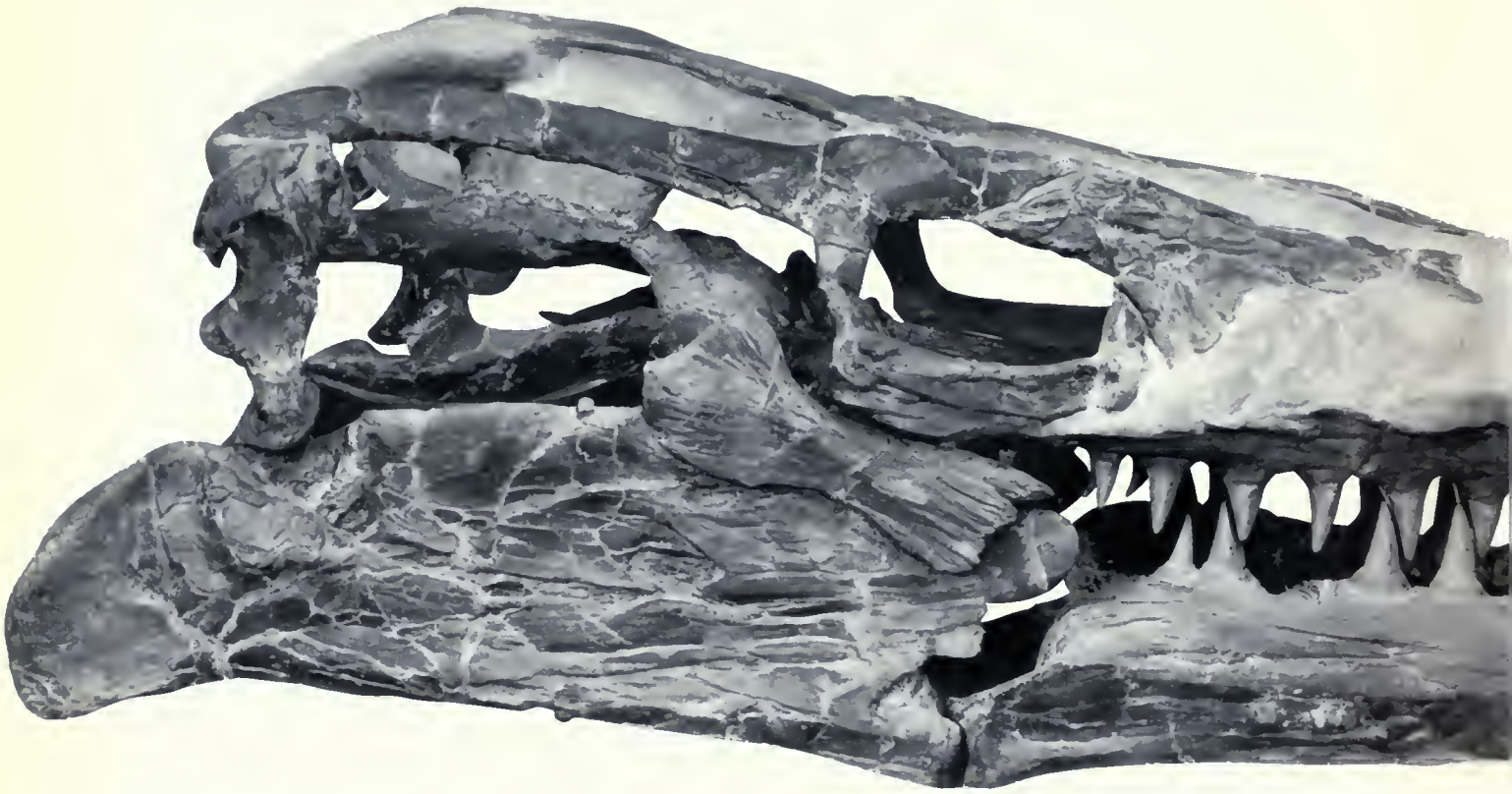
In Dinosaur Park, some 200 kilometers east of Calgary, Alberta, more skeletons of more different kinds of dinosaurs have been excavated than in any other place on earth. It is a very productive site and very scenic. Those of us who have worked in the park are spoiled by the wealth of fossil material that weathers out in the badlands. From a study of the distribution of the dinosaur skeletons, we have detected a large, east-west change in the abundance of different kinds of dinosaurs. Small dinosaurs that probably preferred dense plant growth for cover are more abundant in the west, and large dinosaurs that probably preferred more open, park-like environments are more abundant in the east. The change takes place within a distance of about 20 kilometers. We sampled the sediments in

Apatosaurus excelsus skeleton as it appeared in Field Museum in 1908 (Jackson Park building). The skeleton has long since been completed, using bones from several individuals, and is now the centerpiece of Hall 38. Formerly known as *Brontosaurus*. 26576

which the dinosaur skeletons were buried to see if the fossil pollen and spores showed a similar change in the kinds of plants that were living with the dinosaurs. We found instead that there was no east-west change in the wind-blown pollen and spores. We suspected that this was because it was easier to mix the microfossils by wind and water than it was to mix dinosaur skeletons. The skeletons were much, much heavier and resisted transport. All things being equal, then, small-scale ecological changes might be easier to detect by studying dinosaur skeletons than by studying pollen grains.

Over greater distances the general scarceness of dinosaur skeletons and economics of collecting them give vastly greater significance to data based on the study of fossil pollen grains. We suspect, for example, that horned dinosaurs were either absent or rare in eastern North America. We know that they were abundant and represented by many different varieties in the west. The fossil pollens clearly show that eastern and western North America at that time belonged to two distinct floral provinces—known to specialists as the Aquilapollenites and the Normapolles provinces. Climates along the east coast might have been drier than in the west.

Elmer S. Riggs, distinguished paleontologist who served Field Museum from 1898 until 1942. Riggs and his assistants were responsible for collecting a major portion of the Museum's paleontological material, a collection which ranks with the largest and most important in the world. Among his finds was *Brachiosaurus*, discovered in Colorado in 1900. 49132



Shown here are two of the most formidable sea-going reptiles that were contemporary with their terrestrial cousins, the dinosaurs. Both specimens are to be seen in Hall 38. The mosasaur (above) was abundant in inland seas of North America during the latter part of the Cretaceous Period (about 80 to 65 million years ago). A particularly interesting feature of the mosasaur was the mid-length joint in the lower jaw, enabling it to eat very large prey. Some specimens of the species shown here, *Tylosaurus dyspelor*, exceeded 30 feet in length. Collected in Kansas in 1928. 79878

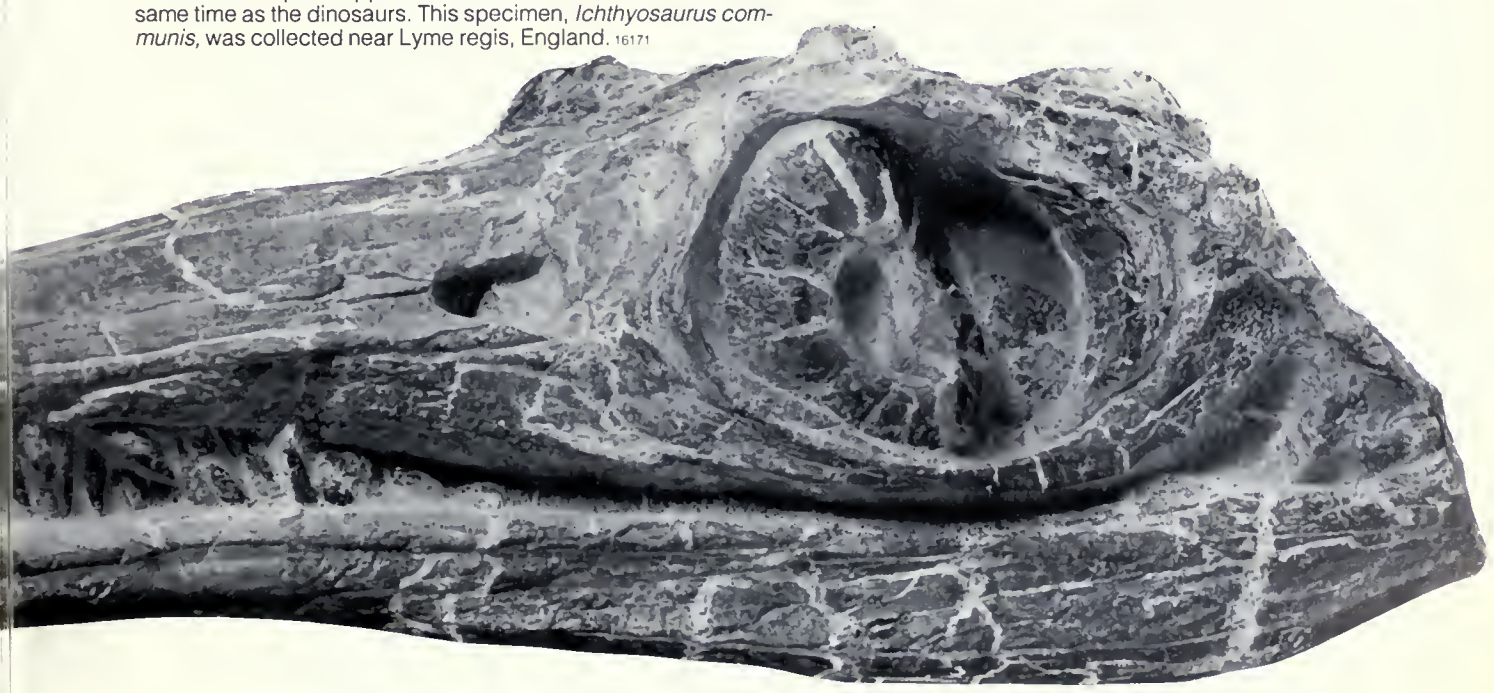
Everyone knows what the giant horned dinosaur triceratops looked like—it's one of the most popular of dinosaurs, and a life-sized model has been placed in front of the U.S. Natural History Museum in Washington, D.C. for kids to climb on. Not everyone knows that the biggest, meanest specimens of triceratops lived in Alberta. The farther south you go the smaller the triceratops specimens become, and none occur south of Denver. A brontosaur called *Alamosaurus* begins to occur at about this latitude and it remains the dominant large dinosaur south to at least the Rio Grande. Pollen data show a similar change in the north-to-south distribution of ancient plants.

It is interesting that we seem to be finding some evidence of a late Cretaceous Rocky Mountain Province. In the past there were some indications that armored dinosaurs, of the kind with tail clubs, and small parrot-pig-like dinosaurs related to the horned dinosaurs might be more abundant west of the high plains—or west of what was then a coastal plain between the interior sea and the mountains. An inland ecology is also suggested by a peculiar duckbilled dinosaur and spectacular dinosaur nesting sites which were

recently discovered in western Montana. At other localities isolated bones can tentatively be identified as belonging to iguanodonts — the upright, slothlike dinosaurs that are so well represented in the Wealden of England and Belgium.

The dinosaurs of eastern Asia were special too. Some were virtually identical to dinosaurs from Alberta. These include small raptorial carnivores with eagle-like claws: ostrich dinosaurs, tyrannosaurs, duckbilled dinosaurs, and armored dinosaurs with tail clubs. Then there are others — giant ostrich dinosaurs with huge claws, archaic lizard-hipped bipeds that look like they belonged to a dim, dinosaurian past of 100 million years earlier, and highly evolved, fancy high-tailed brontosaurs. They look like a Cretaceous Star Wars delegation to us. Because of the mixture of familiar and strange faces, it's likely that the dinosaurs from eastern Asia belonged to the same general faunal province, but were typical of a drier, more continental environment. There is abundant evidence of seasonal aridity and wind-blown sand in eastern Asia at that time. Further to the west, in the lands bordering the Caspian and Aral seas, the few remains of dinosaurs that have been collected usually belong to duckbilled dinosaurs, which look pretty much like skeletons from Alberta. However, a warning flag is up; the fossil pollen grains indi-

The ichthyosaur (below) lived about 225 million to 65 million years ago and, like the mosasaur, sometimes grew to more than 30 feet. Both reptiles appear to have become extinct at about the same time as the dinosaurs. This specimen, *Ichthyosaurus communis,* was collected near Lyme regis, England. 16171



cate that the dinosaurs occur in a plant province different from the one in eastern Asia and western North America. Unusual dinosaurs may yet turn up. Finally, there are the dwarf dinosaurs from the late Cretaceous islands of Europe. We need to know more about them. The islands were then a part of the Normapolles pollen province, which extended beyond a narrower Atlantic Ocean all the way to the arid east coast of North America.

We have already commented on the fact that during Cretaceous time the dinosaurs of the Southern Hemisphere may not have been closely related to those in the Northern Hemisphere. Some of the skeletal similarities we saw are probably the result of convergent evolution, and not a close relationship or mixing of northern and southern faunas. Dinosaurs may have decreased in body size as the Cretaceous equator was approached. Not very many specimens of tropical dinosaurs have been collected, not all of them belong to small animals, and statistical analyses have not yet been carried out. However, I am impressed with the relatively small size of most of the bones I have seen, and how often the bigger dinosaurs that did live in the tropics had long, sail-like fins on their backs. It looks like they had surface-volume problems in hot climates and had to evolve some way of getting rid of excess heat. Interestingly, some of the equatorial crocodiles were giants. They may have been protected by the thermal inertia of lakes and streams they inhabited. Students of fossil pollen tell us that equatorial floras were distinct, and dominated by palms and by plants that were able to withstand dry conditions.

On the other side of the equator the palms merge into southern floras dominated by flat-needled, non-flowering trees and primitive southern beech trees. The northern world of bird-hipped dinosaurs also gave way to a southern world dominated by lizard-hipped dinosaurs. Southern Cretaceous dinosaurs have an archaic, Jurassic flavor. Giant brontosaurs dominated southern temperate zone faunas from Argentina, South Africa, and India. Stegosaurs, or the plated dinosaurs, so typical of late Jurassic fuanas of the Northern Hemisphere, survived until the middle Cretaceous of South Africa and the late Cretaceous of India.

If dinosaurs were not terribly unlike mammals in their body shapes and in their biogeography, what happened to the "lost world" of the Mesozoic? In the first place, I think everyone would agree that dinosaurs were not identical to mammals, and we'll look at the implications of this later. In the second place, there may have been some funny things about the earth as it used to be when the dinosaurs were alive. We should look at how dinosaurs interfaced with their environments.

In many dinosaurs the pupil of the eye was surrounded by a bony ring. Tiny muscles were attached to this ring. They changed the shape of the lens so that the dinosaur could focus on objects which were either close or far away. This bony ring has often been preserved in the fossil record. The diameter of outer edge of the bony ring gives a minimum diameter of the eyeball of the dinosaur.

Dinosaur eyes come in a variety of sizes, which in itself is food for thought. For example, one dinosaur with relatively small eyes has been found in fossil desert sand dunes. Maybe it preferred to be active in the desert during the daytime. Duckbilled dinosaurs had relatively enormous eyes—did they like to feed in the moonlight? Be that as it may, the diameter of the average dinosaur eye was one and one-half times the average diameter of the eye in living mammals. The size of the eye was also relatively enormous in marine reptiles living during the dinosaurian era. Animals generally increase the size of their eyes in order to increase the sharpness of their vision during the daytime or to increase the amount of light that can pass through their pupils at nighttime. Was the dinosaur eye somehow inferior to that of mammals, or were they normally active under what for us would be less than fully illuminated conditions?

People who study fossil pollen and spores also look at diameters. Just for fun, I plotted the diameter for 1,116 species of wind-dispersed pollen and spores belonging to three different basic shapes against geologic time. In all three cases there was a statistically significant decrease in the diameter of the pollen and spores toward the present. In other words, the mean diameter of the pollen and spore grains has decreased to about 40 percent of the mean diameter as it was some 400 million years ago. Of course, smaller grains are carried further by the wind than larger grains. This data can be interpreted in at least two ways. One: selection for smaller grain size has

Protoceratops andrewsi, the earliest and most primitive of the ceratopsians, or horned dinosaurs. On view in Hall 38. 81449→

Charles R. Knight mural depicting how *Protoceratops andrewsi* may have appeared in life (skeleton shown on previous page). CK59050

produced relatively tiny grains that compete better with large, clumsy grains in the struggle for existence. We can call this theory the genetic theory. Or two: the density of the atmosphere has slowly declined over the last 400 million years and in order for a grain to maintain its aerodynamic fitness its diameter had to decrease. We can call this theory the environmental theory. Which was more important, genetics or environment? If it was genetics, we have evidence of a long-term trend that is eminently predictable. This is deterministic evolution. If environment was more important, here is evidence of a gradual but major change in the nature of the planetary atmosphere.

Dinosaurs can get you into trouble too. Over the last few years several of us have assembled data which relates the circumference of limb bones, or more specifically the circumference of the upper arm and upper leg bones, to body weight in living mammals. We did this in order to estimate quantitatively the weights of extinct creatures such as dinosaurs. We calculated a precise mathematical relationship which worked very well with North American bison and African giraffes and even with Australian lizards, and lots of other animals as well. We used our formula to calculate a live weight—about 40 metric tons—of a brontosaur whose skeleton is on view at Pittsburgh's Carnegie Museum. To confirm the calculated weight we carefully sculpted a scale model of the brontosaur based on the Carnegie skeleton. We took it to a hydraulics laboratory, and after a series of repeated immersions to measure the model's volume, we found that the weight of the living animal was about 20 metric tons—half as heavy as the bones indicated it should be. Again, the data can be interpreted in at least two ways. One: there are many uncertainties in the equation and in the model. We can call this theory the theory of minimum astonishment. Or two: maybe the force of gravity at the surface of the earth was a bit stronger 140 million years ago.

The nearest to a compromise between a pollen grain and a dinosaur skeleton might be the skeleton of a flying reptile. Like all compromises, it could jar the sensibilities of some. However, flying reptiles did float in the air and they did look something like a dinosaur. An engineer at the National Research Council in Ottawa, Canada and I spent more than a year trying to calculate the density of the atmosphere during the dinosaurian era, based on the estimated flight characteristics of birds, bats, and flying reptiles. The effects of various uncertainties prevented us from coming to any conclusions—animals can change their shapes at will and pollen grains cannot. Out of our investigation we were able to salvage only one fact. Relative to body weight, which was very carefully estimated by two independent researchers, the hind leg in one flying reptile with a wingspan of 7 meters (23 feet) was built as strongly as it is in small living hawks that dive on their prey. Technically speaking, the cantilever strength of the femur in the flying reptile was about one and one-half times the strength it would be in a modern flying bird with the same body weight. It's hard to understand why such a lightly constructed animal would have landing gear that were so strong.

If the density of the atmosphere at ground level during the latter part of the dinosaurian era (some 70 to 100 million years ago) is not known with precision, neither is the composition of the atmosphere. Studies of fossil carbon residues may indicate a larger amount of oxygen in the atmosphere, and from four to ten times as much carbon dioxide. We have all read about the warming effect of carbon dioxide, and this may be a very important factor in warming the polar regions during the dinosaurian era. We know that carbon dioxide was depleted in the atmosphere during the recent ice ages. These lower concentrations of carbon dioxide may have caused some plants, such as various photosynthetically efficient grasses, to spread at the expense of less photosynthetically efficient forests. Would increased concentrations of atmospheric carbon dioxide during the dinosaurian era have stimulated more rapid plant growth? Or were the dinosaurian age plants, on the whole, less efficient than modern plants? The amount of food that plants could produce would have directly controlled the density of dinosaur populations.

How much richer the world would be if our wildlife reserves and zoos still had dinosaurs in them! But consider the glory that once was this ancient saurian empire. Surely its gradual disintegration through a million years or more must have been a saddening, mellowing, but somehow gloriously gratifying saga. Consider what rewards would await the explorer paleontologist in late Cretaceous time. A few great clumsy stragglers plow on toward a new world that has no place for them. Around the old and outmoded giants swarm lean and aggressive mammals and birds, stealing the food from their very mouths. Dinosaurian age pollen grains slowly settle to the ground, their elaters broken, their bladders punctured. High overhead soar the small, new, and smooth grains, on toward the new frontier.

Unfortunately, I have besmirched my credentials by supporting theories that the dinosaurs were suddenly exterminated in an extraterrestrially provoked, planetary-wide disaster of stupendous proportions. I have thereby dabbled in the witches' brew of unrestrained catastrophism. Fortunately, with these views, I am nearly alone among my colleagues who study dinosaurs. Of the thirty-odd researchers so engaged in North America, fully half of them have battled in print on the side of a gradual decline of the dinosaurs before their extinction. Most of the rest are non-combatants. About three have recently shown an unhealthy interest in theories about catastrophism, and one I suspect has egged me on in a supportive way for several years. Let me first explain why I am a heretic. Then, because of the offense I have thereby committed against symmetry and integrity, let me try to replace the noble edifice with a new one. And in expiation for some of my sins, I admit that perhaps a quasi-dinosaurian era has indeed been gradually replaced by a more modern quasi-mammalian era on some other planet in the galaxy.

How does one dare to think that dinosaurs might not have gradually become extinct? From an evolutionary point of view we have seen that dinosaurs were dynamic, not static creatures. They did evolve. Their skeletons became more complicated through time. Because of general trends in size from giant brontosaurs to smaller-sized chewing dinosaurs to the small carnivores that gave rise to the birds, it seems likely that on the average, metabolic rates increased in dinosaurs through time. They were becoming warm-blooded. By late in the dinosaurian era, in several lines of small carnivorous dinosaurs the brain was approaching the size of the brain in some living mammals. Anatomically, dinosaurs were not archaic, overspecialized anomalies clumping about during the closing years of the dinosaurian era. They were plastic, progressive animals near the cutting edge of evolution.

Skull of the dinosaur *Albertosaurus* (formerly named *Gorgosaurus*), on view in Stanley Field Hall since 1956. 81592

It isn't easy to find dinosaur remains more or less on demand, and it is difficult to precisely date strata which were deposited about 65 million years ago, when dinosaurs vanished from the earth. For example, the final subdivision of Cretaceous time, known to specialists as the Maastrichtian Age, lasted from 73 to 65 million years ago, or for about 8 million years. Dinosaurs are known to have inhabited North and South America, Europe, Asia, and the African and Australasian regions during this time. We cannot demonstrate, for example, that they became extinct first in Asia, then in Europe, and so on. It is not possible to see a geographic pattern in the extinction of the dinosaurs. However, no dinosaur was known to have been alive during the next interval of 5 million years, known to specialists as the Danian age.

The best record of the number of different kinds of dinosaurs that were alive throughout the dinosaurian era is from North America. This record suggests that the number increased up to the very end. A fossil field near Montana's Fort Peck Reservoir is becoming a battlefield in the debate on the extinction of the dinosaurs. The debate concerns whether or not dinosaur bones are gradually decreasing in abundance in sediments that were accumulating during the final few tens of thousands of years of the dinosaurian era. Evidently Mother Nature played a trick on us so that the last sediments to be deposited at the very end of the age of dinosaurs are often covered with grass and sagebrush. We can't find the dinosaur bones in them because we can't see them. And in the places where these sediments are exposed they have often been mixed by ancient rivers with sediments deposited immediately after the dinosaurs died. No convincing case for a gradual extinction of the dinosaurs has been made here either.

Other paleontologists who study different kinds of fossils have also come to a variety of conclusions about what happened to various groups of organisms when the dinosaurs died. A few years ago I estimated, perhaps incorrectly, that as many as three-quarters of all of the species living on our planet disappeared with the dinosaurs. The plants growing on the land also changed in interesting ways. Fossil pollen and spores have been extremely useful guides to finding the level in the strata where the great extinction occurred. Exactly at this level in many localities in the high plains of the United States and Canada a very peculiar clay has been found. The same clay has also been found in sediments which were laid down beneath the seas around the world. For me, the clay is a vital clue to the mystery of the extinction of the dinosaurs. This clay is made of extraterrestrial material, and provides strong evidence that the dinosaurs died in a disaster that came to us from space.

The asteroid theory, widely reported in the press and widely debated in scientific circles, proposes that an asteroid struck the earth, creating a blast equal to the force of half a million gigantic nuclear explosions. Vaporized rock would be blown around the world, and condense as fine particles of dust high in the atmosphere. Computer models suggest that light from the sun would not reach the surface of the earth for several months. Ground temperatures would fall all over the world to near the freezing point or below, and the rain would be polluted with acid. The dust would finally fall out of the atmosphere and form the clay layer that is found around the world.

There are some odd things about the extinction. It's hard to understand why the small dinosaurs with large brains became extinct, while many different kinds of mammals survived. There were very few extinctions among the animals and plants that lived in freshwater streams and lakes. As already noted, water-dwelling reptiles continued to be the largest animals in

continental environments for many years. Some birds evolved into large, vicious-looking ground predators. However, small mouselike mammals rapidly became more numerous and within a few million years some of them grew to fairly respectable sizes.

Several other great or "mass" extinctions have occurred during the history of life on earth. Some researchers think that the mass extinctions may have greatly accelerated evolution by breaking up stable ecological formations and allowing new animals and plants to become dominant. In other words, the more numerous the extinctions, the more rapid the evolution. I doubt that this is so. Evolution is classically thought to be the result of a struggle for existence between organisms living in a relatively stable physical environment. A mass extinction, like the one that took place when the dinosaurs died, occurs when the set of physical conditions is rapidly and very dramatically altered all over the world at the same time.

There is a tendency for evolution to speed up through time. The rate of the speed-up seems to be about proportional to the evolutionary level already achieved. It works like compound interest rates. Things are slow in the beginning but they really perk up later on. Think of how in the dim past carbon and hydrogen atoms combined to form the genetic code, and how this made inheritance possible in the first place. Students of biology can appreciate the enormous possibilities that opened up when primitive cells fused together to form advanced, neucleated cells, or when long ago fungi combined with marine algae to form plants that could live on land.

Most of us would agree that life has made some progress on our planet since the age of the jellyfish more than half a billion years ago. It might be difficult to describe what progress is, either with words or with

Right, and on facing page, stages in assembling the skeleton of *Albertosaurus*, a task which required two years (1954-56) and the involvement of several staff members. Orville "Gilly" Gilpin, then chief preparator of fossils, is shown positioning the pelvic bones. William D. Turnbull, who recently retired as curator of fossil mammals (standing), is shown with assistant as they position the 200-lb. skull. 81565 (left), 81569 (right)

numbers, but intuitively it is not difficult to suspect that progress has been made. In this sense, then, evolution can be thought of as a fairly positive process. It seems to me there has also been a pattern of change from relative simplicity to greater complexity. Many examples can be cited. That patterns might exist in evolution shouldn't seem astonishing. It might have been suspected from the presence of patterns that have been discovered in other branches of science. Why should evolution be different? Must it be random or arbitrary? The story of the upward struggle of dinosaurs and other living things to higher levels of complexity might be the story of life anywhere in the cosmos. This I offer to you to replace the integrity and symmetry that was lost when we barbarously kill dinosaurs with an asteroid.

Other paleontologists may by now strongly suspect that I have strayed a bit from a popular evolutionary philosophy that deplores directionism, determinism, gradualism, and adaptationism as valid biological concepts. You are right. I do think these concepts have some validity. And I want to encourage you to consider them in your thinking as well.

If we were to abandon these concepts altogether, then all of the history of life appears as if it were a desert of evolutionary noise—a kind of random walk devoid of any real meaning for human existence. This view of life would make paleontology sterile. How can we imagine organisms that adapt only to their physical environment and show no effects of the complexity in the biological world in which they must successfully compete to survive? Must we presume that any have not come to an end of their development in the human-dominated world of the recent. Maybe we can think about the future evolution of plants. Will pollen grains become more complicated and beautiful? Can

Gilly Gilpin sponges the *Albertosaurus* skull as the project nears completion. It became the world's first self-supporting dinosaur skeleton. (As seen today in Stanley Field Hall, *Albertosaurus* rises above the skeleton of *Lambeosaurus,* an herbivorous dinosaur.) 81669

we dare to think a bit positively about ourselves? We are after all at the end of a very long evolutionary history. There were failures—the big australopithicenes didn't make it. Neither did the neandertals. But monkeys, parrots, elephants, and dolphins have relatively large brains. Might there not be grounds for optimism about the future of life? And would there not be the freedom to think again, without worrying about being branded as pariahs of directionism, determinism, gradualism, and adaptationism? Now, let's return to the messy business of the extinction of the dinosaurs.

If the extinction was the result of an asteroid's impact, the fatal stresses had absolutely nothing to do with the adaptive finesse which had accumulated through evolutionary processes prior to the end of the dinosaurian era. Because of the great number of species, not to speak of individuals that were lost, a great deal of organic complexity that had slowly evolved up to that time was also lost. This would not be an evolutionarily neutral event. It would be a very bad show for the advancement of life on earth. Imagine if one mass extinction would occur through a collision with an asteroid, followed five million years later by another mass extinction resulting from the explosion of a nearby supernova, then five million years later yet another mass extinction occurring as the solar system passes through a giant molecular cloud, and so on. The net result of a closely spaced series of nonbiological extinctions might well be something like a random evolutionary wandering unmarked by any trends. Like a dazed boxer staggering from blow to blow.

Fortunately the dinosaurs were eliminated in one clean, quick blow and there have been no equally disasterous mass extinctions since. The net result of their extinction was the replacement of one set of evolutionary actors by the second string. We are the descendants of the second string. But the great drama of life has remained the same.

Sometimes our colleagues who study physics engage in cerebral exercises they call thought experiments. As far as I'm concerned, exercise is not something one should be too compulsive about. And I suspect this natural and civilized reluctance is not uniquely limited to me. But it has been said that the benefits of thought experiments far outweigh the costs—no equipment or facilities are needed except for those which occur between the ears. Let us then embark on a mild sort of paleontological thought experiment. Consider what might have happened, evolutionarily speaking, had the mass extinction that marked the end of the dinosaurian era not occurred. There are many things that we could think about. Apparently the plant world was not greatly affected, over the long term, by the extinctions. The world of marine fishes is so strongly marked by parallel evolution that the end products of a no-extinction scenario might not have been very different from those of an extinction scenario. But what about the dinosaurs themselves?

The most interesting trend for me is the trend describing the maximum size of brain on earth through geologic time. On the average, organisms need more complicated brains to react to increasingly complicated environments. For example, we know that the number of different species of multicellular organisms has greatly increased through geologic time. There are two important things to note. One is the stability of the trend. Data from the last 65 million years predict that creatures with human-sized brains or larger would have appeared on earth by another 25 million years at the latest, with a probability greater than 99 percent. The other important thing to note is that by the end of the dinosaurian era some dinosaurs had brains as large as those of the mammals that were alive at that time, after correcting for body size effects. Dinosaurs were on the curve of maximum brain size through geologic time. For our thought experiment, then, let us project the evolutionary increase in the dinosaurian brain forward into the future they never had. We know that human-sized brain proportions are possible; after all, they do exist. What would the anatomical consequences be of a human-sized brain in a dinosaur? Remember, we have to make something that might work, and random evolution probably wouldn't make anything that would be very useful in the struggle for existence.

I think it might be a good idea to divide the anatomical consequences of our hypothetical highly evolved dinosaur, or what we can call a "dinosauroid," into three kinds. Natural selection isn't perfect, even when it has been acting over many tens of millions of years. There are always many little details, like my appendix, that are due to accidents of ancestry, and not perfection of adaptation. We use these leftovers from ancestry to classify our fossils, and indeed all living organisms, into natural systems of ancestor-descendant family trees. Our dinosauroid would show the effects of his ancestry. So what we might call its primary characteristics are those which would seem to be firmly linked to having a large brain irrespective of ancestry. Secondary characteristics might be those that would be left

over from the fact that its ancestor was a small theropod dinosaur. This is because the large-brained dinosaurs of late Cretaceous time were all small theropods, to the best of our knowledge. Tertiary characteristics would be those stemming from a general dinosaurian or reptilian ancestry.

Among the primary characteristics would be warm-bloodedness. Our dinosauroid would be nice and warm to touch. This is because 20 percent of our resting metabolism, or basal metabolism, goes to fuel the brain. The brain is a very expensive organ to maintain, and a crocodile with a human brain-transplant would be utterly exhausted without moving. There would be no energy left over for activity.

Our dinosauroid would have to eat a lot to maintain his energy balance. Here a separation between the mouth and nasal passages would be useful in order to eat and breathe at the same time. This is called a secondary palate: we have one and so did ostrich dinosaurs many millions of years ago.

One consequence of a relatively large brain is that the rest of the skull would seem relatively small. This is obvious in embryonic lizards, so we can use the braincase-facial proportions in embryonic lizards as a guide.

Another consequence of a big brain is a relatively large head on a relatively small body. This is particularly true of animals in the 30-70 kg (66-154 lb.) range. A large head is most easily supported by a vertical neck centered beneath it. This adaptation is apparent in apes, and also in bone-headed dinosaurs, which had small brains but large heads and lived many millions of years ago.

Then there is the problem of the backbone. A horizontal backbone provides a good framework for the attachment of strong running muscles. A vertical

Triceratops calicornis, on view in Hall 38. This was the largest of all horned dinosaurs. The head, shown here, was about 7 feet in length. This specimen was discovered near Chalk Buttes, Montana, in 1904. 17464

backbone provides an energy-efficient posture for carrying the upper part of the body and a heavy head. Ostriches are bipedal, like the small theropod dinosaurs of long ago, and carry their backbones in a horizontal position. My guess is that a big head on an ostrich would be tiresome to carry around, and get bashed on branches and trees in making sharp turns. The dinosauroids' immediate ancestor might be termed *Dinosauroides horizontalis*, but the large-brained descendant might better be called *Dinosauroides erectus*.

The human leg has been the target of very strong selective forces and is an extremely efficient locomotive organ. The proportions of the human leg have to go into an upright dinosauroid.

We can next consider what structures might have been the result of a small theropod ancestry. These will be the secondary characteristics.

The teeth were reduced in some small theropods and in at least two families they were lost entirely. Teeth have been lost in birds, which were also descended from small theropod dinosaurs. The jaws of the dinosauroid are thus toothless and provided with keratinous surfaces—the same substance that nails, horns, and hooves are made of.

The proportions of the arms are taken from ostrich dinosaurs. The hands had three fingers in most small theropods.

The pelvic canal is very large in some small theropods, and we suspect that they may have given birth to living young. The need to pass large eggs, with embryonic tissues encased in a more or less rigid shell, through the pelvic canal would be avoided. This would allow the hips to be narrower and enhance the efficiency of walking. The dinosauroid thus has a tentative, none-too-courageous navel.

There is no kneecap in small theropods. The muscles of the upper leg are attached to a blade on the upper part of the shaft of the tibia.

The foot is a compromise between the foot in a small theropod and the foot in a tree kangaroo. In both animals the small toes are on the inside, not the outside of the foot.

The tertiary characteristics are further removed from the dinosauroids' immediate ancestry, and can be found in dinosaurs and other reptiles in general. These include the large eyes, absence of ears, presence of a dewlap as a secondary sexual characteristic, the containment of the external genitalia in a pelvic pouch, and the absence of breasts. There are other details we could consider, but these are the major ones.

There are several hypotheses that I would like to leave with you. I suspect that there is some truth in them. The first would be that just as in the rest of nature there is structure in the history of life. It is not a random process; there are preferred evolutionary pathways and the evidence of these is parallel and/or convergent evolution. We should study preferred evolutionary pathways more carefully because they will help us to understand the evolution of complex life no matter where it occurs in the galaxy or even the cosmos.

A second hypothesis is that the dinosaurian world was special. It was an experiment in the evolution of sophisticated organisms that was brought to an end by an abiotic, external force. The dinosaurian world then can give us some feeling for how much variation there can be around preferred evolutionary pathways. Thus, a study of the dinosaurian world helps us to anticipate the kind of differences mankind one day can expect to find in the biospheres of planets that circle faraway stars. Those biospheres probably exist. Our colleagues in astronomy assure us that sunlike stars are common. There is good evidence that planets are abundant also, and the organic compounds that are the building blocks of life are broadly spread through nearby space.

A third hypothesis is that the human form is not an evolutionarily surprising form. It may represent a target that is easy for natural selection to hit. If evolution is a generally positive process, and I think it probably is, it could be expected that some biospheres could produce something like what we have called a dinosauroid. The Search for Extraterrestrial Intelligence, or SETI, is a project supported largely by astronomers to use radio telescopes to search for intelligence-carrying electromagnetic signals. Many articles have been written about SETI in scientific journals, in popular scientific journals, and in the newspapers as well. An evolutionary biologist might suggest to his astronomer friends not to be too astonished if, when exotic radio signals are detected, the extraterrestrial intelligence that transmits them has a familiar look.

It would be grossly unfair of me to suggest that this discussion represents a summary of what is solidly known about dinosaurs or the evolution of life on earth. It is simply how I, as one human being, see the natural world that I live in. Probably it's a real period piece, and full of mistakes. But whether it's completely wrong or not, it does somehow say what I feel at night when I look up into the boundless vault of a soft, star-filled prairie sky. **FM**

Kenya/Tanzania Safari
March 3-23, 1989

FIELD MUSEUM TOURS

Kenya/Tanzania Safari

March 3-23, 1989

Leader: Audrey Joy Faden

Price: $6,350

ITINERARY

March 3
Fly from Chicago to London via British Airways.

March 4
Fly from London to Nairobi, Kenya. Day rooms in London. Evening flight to Nairobi.

March 5
Nairobi. City tour. Welcome cocktail party and dinner.

March 6
Nairobi/Amboseli National Park, justly famous for its big game and superb views of Mt. Kilimanjaro. Afternoon lecture by local researcher. Late afternoon game drive.

March 7
Amboseli National Park. Morning and afternoon game drives. Mid-day at leisure to relax at the lodge or swim in the pool.

March 8
Amboseli National Park/Namanga/Gibb's Farm, Tanzania. Cross the border, where we clear customs before proceeding into Tanzania to Gibb's Farm, where the remainder of day is at leisure.

March 9
Gibb's Farm/Serengeti National Park. Game drives in the Ngorongoro Conservation Area and the Serengeti.

March 10
Serengeti National Park. Full day exploring this vast area.

March 11
Serengeti National Park/Olduvai/Ngorongoro Crater. Visit Olduvai Gorge and the site of Louis and Mary Leakey's discovery of *Zinjanthropus bosei.* Continue on to the spectacular Ngorongoro Crater.

March 12
Ngorongoro Crater. Full day down in the crater, tracking and photographing the animals.

March 13
Ngorongoro Crater/Lake Manyara National Park. Depart to Lake Manyara Hotel, set in lovely gardens with a swimming pool overlooking the park. Optional activities.

March 14
Lake Manyara National Park. Morning and afternoon game drives, exploring the diversity of this park.

March 15
Lake Manyara National Park/Namanga, Kenya/Nairobi. Drive back to Arusha for lunch and continue on to the Namanga border, clear customs and return to Nairobi.

March 16
Nairobi/Aberdare National Park/The Ark. This morning you proceed into deep forested area alive with some of the finest game viewing in Kenya. After lunch at Aberdare Country Club transfer to The Ark, "berthed" over a waterhole where the animals come to drink. From a ground-level lounge with large picture windows, you have an eye-to-eye view of this constantly changing scenario.

March 17
Aberdare National Park/Samburu Game Reserve. This reserve is home to several species found only in these northern areas.

March 18
Samburu Game Reserve. Your game viewing takes you through a variety of landscapes. Bird enthusiasts will be well rewarded with over 300 species, including the martial eagle, in this reserve.

March 19
Samburu Game Reserve/Mount Kenya Nanyuki. Drive to the famous Mt. Kenya Safari Club. The grounds cover 100 acres of blooming flower beds, ponds with water lilies and stands of shade trees—a litoral oasis in the middle of the African bush.

March 20
Mount Kenya Nanyuki/Nairobi/Masai Mara Game Reserve. Drive back to Nairobi and after lunch depart on the afternoon flight to the Masai Mara Game Reserve, where we'll stay in a luxury safari camp.

March 21
Masai Mara Game Reserve. Enjoy a day of game viewing in the Mara, one of the last strongholds of the great herds.

March 22
Masai Mara Game Reserve/Nairobi. After one last game run in the Mara, return to Nairobi by air. Remainder of day at leisure.

March 23
Nairobi/London/Chicago. Midnight flight to London on British Airways. Connect to British Airways to Chicago, arriving later the same day.

Antarctica

Discovering Antarctica, the Strait of Magellan, Tierra del Fuego, and Cape Horn aboard the *Illiria* under the leadership of Dr. Bruce D. Patterson, associate curator and head of the Division of Mammals at the Field Museum of Natural History.

February 20-March 7, 1989

Pre-Cruise Extension to Patagonia and the Lake District

February 15-23, 1989

The Galapagos

Aboard the m. v. *Santa Cruz*

March 3-14, 1989

Optional Extension to Peru March 14-20

Price: $3,550-$3,840

March 3: Chicago/Miami/Quito. Welcome party and orientation.
March 4: A full day excursion to the colorful Indian fair of Otavalo.
March 5: All-day birding excursion up into the mountains outside Quito.
March 6: Fly to Guayaquil and on to Baltra where we board the *Santa Cruz.*
March 7: Cruising—Bartolome and Tower Islands.
March 8: Cruising—Isabela and Fernandina Islands.
March 9: Cruising—North Seymour Island.
March 10: Cruising—Hood and Floreana Islands.
March 11: Cruising—Santa Cruz and Plaza Islands.
March 12: Cruising—James Island.
March 13: This morning we cruise to Baltra, disembarking to board our flight to Guayaquil. Farewell dinner.
March 14: Return flight to Chicago.

Join us as we explore one of the world's greatest living laboratories of natural history under the leadership of Dr. David E. Willard, collection manager of the Bird Division of the Field Museum of Natural History. The Galapagos Islands—birthplace of Darwin's "Origin of Species"—situated 600 miles off the coast of Ecuador, remain remote and out of the elements of nature where an abundance of strange creatures known nowhere else on earth reside. An optional trip to Peru at a cost of $1,450 includes visits to the world-famous site of Machu Picchu, Lima, and Cuzco.

For reservations, call or write Dorothy Roder (322-8862), Tours Manager, Field Museum, Roosevelt Rd. at Lake Shore Dr., Chicago, Il 60605

Field Museum of Natural History
Membership Department
Roosevelt Road at Lake Shore Drive
Chicago, IL 60605-2499

INSIDE ANCIENT EGYPT

The most dramatic exhibit ever created to tell the story of the mysterious world of the ancient Egyptians opens Friday, November 11.

The new exhibit, on two floors of the Field Museum, includes a fully reconstructed royal tomb with 35-foot burial shaft (for you to walk through), 23 authentic mummies, a working canal and living marsh (with growing papyrus), the rare, 3,847-year-old royal boat of a pharaoh, an Egyptian marketplace, and more than 1,400 rare artifacts and priceless treasures.

Ancient Egypt awaits you!

FIELD MUSEUM OF NATURAL HISTORY BULLETIN

November 1988

INSIDE ANCIENT EGYPT

Field Museum of Natural History Bulletin

Published since 1930 by
Field Museum of Natural History
Founded 1893

Editor/Designer: David M. Walsten
Production Liaison: Pamela Stearns
Staff Photographer: Ron Testa

BOARD OF TRUSTEES

Robert A. Pritzker
Chairman
Mrs. T. Stanton Armour
George R. Baker
Robert O. Bass
Gordon Bent
Mrs. Philip D. Block III
Willard L. Boyd,
President
Robert D. Cadieux
Worley H. Clark
James W. Compton
Frank W. Considine
William R. Dickinson, Jr.
Thomas E. Donnelley II
Thomas J. Eyerman
Marshall Field
Ronald J. Gidwitz
Clarence E. Johnson
Richard M. Jones
John James Kinsella
Robert D. Kolar
Hugo J. Melvoin
Leo F. Mullin
James J. O'Connor
Mrs. James J. O'Connor
James H. Ransom
John S. Runnells
Patrick G. Ryan
William L. Searle
Robert H. Strotz
Mrs. Theodore D. Tieken
E. Leland Webber
Blaine J. Yarrington

LIFE TRUSTEES

Harry O. Bercher
Bowen Blair
Stanton R. Cook
Mrs. Edwin J. DeCosta
Mrs. David W. Grainger
Clifford C. Gregg
Mrs. Robert S. Hartman
Edward Byron Smith
John W. Sullivan
J. Howard Wood

CONTENTS

November 1988
Volume 59, Number 10

NOVEMBER AND DECEMBER EVENTS AT FIELD MUSEUM 3

WELCOME TO ANCIENT EGYPT
By Susan Nelson 6

THE EGYPTIAN COLLECTION AND THE LEGACY OF EDWARD E. AYER
By Frank J. Yurco, Consultant to "Inside Ancient Egypt" . . . 20

BEHIND THE SCENES: THE UNSEEN SIDE OF "INSIDE ANCIENT EGYPT"
By Susan Nelson 23

MOVING THE TOMB
By Robin Faulkner, Design and Production; and Nina Cummings, Photography 28

DIORAMAS: A JOURNEY THROUGH THE MIND'S EYE
By Susan Nelson 29

FIELD MUSEUM TOURS. 30

COVER

Papyrus Book of the Dead of Isty, on view in the burial groups section of "Inside Ancient Egypt." This scene shows Isty, a chantress of Amun, venerating Osiris and Isis. From the XXIst Dynasty. Excavated at Deir el-Bahri, Egypt in 1891. Ron Testa 110708

Sherry L. DeVries, manager of Public Relations, coordinated the editorial, design, and production activities in the preparation of this special issue on "Inside Ancient Egypt."

Members' Preview Evenings for "Inside Ancient Egypt"

You are invited to attend the Members' Preview of "Inside Ancient Egypt" at Field Museum of Natural History, Monday, November 7 through Thursday, November 10, 5:00 P.M. until 10:00 P.M.

Because the capacity of the new exhibit area is limited, our members are asked to attend the preview evenings alphabetically by last name. Last name: A-F November 7, G-L November 8, M-R November 9, S-Z November 10.

The Museum's store will be open until 9:45 P.M. Beverages will be available for purchase from the cash bar. A ticketing system to regulate admission to the exhibit will be implemented that evening. Tickets will be distributed at the central booth in Stanley Field Hall. Questions, please call the Membership Department at 922-9410, ext. 453.

City Musick

Chicago's highly acclaimed 18th-century orchestra, is holding monthly performances in Field Museum's Stanley Field Hall through April. Ten percent discount on tickets for Field Museum members. Performances include Beethoven on November 18 and Handel's "Messiah" on December 21. Call City Musick at 642-1766 for more information.

Field Museum of Natural History Bulletin (USPS 898-940) is published monthly, except combined July/August issue, by Field Museum of Natural History, Roosevelt Road at Lake Shore Drive, Chicago, IL 60605-2496.

Copyright ©1988 Field Museum of Natural History.

Subscriptions: $6.00 annually. $3.00 for schools. Museum membership includes *Bulletin* subscription. Opinions expressed by authors are their own and do not necessarily reflect the policy of Field Museum. Unsolicited manuscripts are welcome. Museum phone: (312) 922-9410. Notification of address change should include address label and be sent to Membership Department. Postmaster: Please send form 3579 to Field Museum of Natural History, Roosevelt Road at Lake Shore Drive, Chicago, IL 60605-2496. ISSN: 0015-0703. Second class postage paid at Chicago, Illinois and additional mailing office.

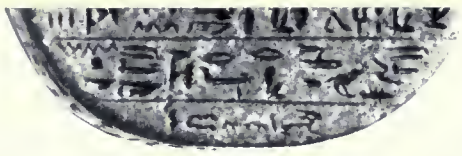
A Special Invitation to Museum Members to

A FAMILY CHRISTMAS TEA AT FIELD MUSEUM

Thursday, December 8, 1988

Johns Hopkins University

LL88201 "Inside Ancient Egypt"
Tickets: $20 ($15 Members)



Heart scarab (lower side) with inscription from Book of the Dead. For more on heart scarabs see glossary, p.8 ➞

Continued ▷

ADULT PROGRAMS

Registration

Be sure to complete all requested information on this registration application. Adult program advance registrations are confirmed by mail. For registrations received less than two weeks before the program begins, confirmations are held at the West Door one hour before the program begins. Phone registrations are accepted for adult programs using Visa/MasterCard/Amx/Discover. There is a $15 minimum charge for credit card registrations. Please call (312) 322-8854 to register. For further registration information, consult the November/December Adult and Family Program Brochure.

Return complete registration with a self-addressed stamped envelope to:

Field Museum of Natural History
Department of Education, Adult Programs
Roosevelt Road at Lake Shore Drive
Chicago, IL 60605-2497

Name _____

Address _____

City _____ State _____ Zip _____

Telephone: Daytime _____ Evening _____

☐ Member ☐ Nonmember

American Express/Visa/MasterCard/Discover

Card Number _____

Signature _____ Expiration Date _____

Program Number	Program	#Member Tickets	#Nonmember Tickets	Total Tickets	Amount Enclosed
				Total	

☐ Scholarship requested

EVENTS

ADULT COURSES

Egypt: The New Kingdom
Frank J. Yurco, Ph.D. Candidate,
Department of Near Eastern Languages and Civilizations,
University of Chicago

The New Kingdom marked a period of Egyptian imperial expansion. There was an influx of much foreign influence creating a fresh, cosmopolitan atmosphere expressed in new art forms and cultural expressions. Pharaohs built enduring stone monuments that still evoke awe in the modern visitor. The New Kingdom included a female pharaoh who ruled successfully for over 20 years, an attempt at massive religious reform, and the short, tragic reign of Tut-ankh-Amun.

AC88401 Tuesdays, 7:00 p.m.-9:00 p.m.
November 8-December 13 (6 sessions)
$60 ($50 members)

Art and Architecture in Ancient Egypt
Lorelei H. Corcoran, Egyptologist

The art and architecture of pharaonic Egypt is rich in iconography. Learn to decipher the symbolism and representation of this era using examples of royal and non-royal portraiture, pyramids, temples, and mummification and the funerary arts. Discuss the social and religious requirements of temples and tombs.

AC88402 Wednesdays, 7:00 p.m.-9:00 p.m.
November 9-November 30 (4 sessions)
$50 ($40 members)

"Inside Ancient Egypt": A Walk-Through
Frank J. Yurco, Ph.D. Candidate
Department of Near Eastern Languages and Civilizations,
University of Chicago

The program begins with an introduction to ancient Egyptian civilization and suggestions for viewing the different sections of the new exhibit. Then participants are free to explore "Inside Ancient Egypt" on their own. Egyptologist and exhibit consultant Frank Yurco is available throughout this time in the exhibit for the opportunity to answer subject matter and exhibit related questions. Please indicate if you have a second choice of date for this class.

AC88403 Monday, Nov. 21 (1 session) 7:00-9:00 p.m.
AC88404 Wednesday, Dec. 14 (1 session) 7:00-9:00 p.m.
$10 ($8 members)

Also in November/December

Studying the Mountain Gorilla: Into the Third Decade
David Watts, Assistant Research Scientist, Department of Anthropology, University of Michigan
Saturday, November 19, 1:30 p.m.

THE MOUNTAIN GORILLAS OF AFRICA are an endangered species; only some 500 remain in the world today. Their plight and the destruction of their tropical forest habitat has caused great concern throughout the world. Dr. Watts discusses the importance of studying the behavior of mountain gorillas, especially their social relationships. The behavior of these intelligent animals seems to have much in common with that of humans.

Join Dr. Watts as he brings us up to date on the lives of Effie, Pablo, Titus, Simba, and others. These gorillas were introduced to the world through the work of Dian Fossey and her associates. Hear what is being done in the areas of public education, habitat protection, and economic development, to help or harm the mountain gorillas. Dr. Watts conducted field research at Karisoke Research Centre in Rwanda, Africa, serving as director of the Centre in 1986 and 1987. He has returned to the University of Michigan for a year to share his research findings with the scientific community and the public who are fascinated by these gorillas.

LL88202 Studying the Mountain Gorilla
Tickets $6 ($4 members)

The Making of a Bestiary
Rosamond Wolff Purcell, Photographer
Saturday, December 10, 1:30 p.m.

ROSAMOND WOLFF PURCELL is an artist/photographer who entered the scientific world of museum collections to photograph objects. She did this not for the scientific record, but rather as an artist and interpreter. Her goal was to make visual sense of the collections and to capture the strange and haunting beauty of the specimens.

Using her photographs featured in the Museum's special exhibit "Illuminations: A Bestiary," Ms. Purcell discusses her pursuit of these hidden objects contained within the world's great museums. She traveled from back rooms of the University of Copenhagen to the Museum of Comparative Zoology at Harvard University. She was, in her own words, "a bull in a china shop," examining scientific specimens from an artist's point of view.

Share the extraordinary world of the artist working with the scientist to explore the hidden masterpieces of museum collections. Join Rosamond Wolff Purcell as she describes her unique photographic collection and the process of "making a bestiary."

LL88203 The Making of a Bestiary
Tickets $6 ($4 members)

WEEKEND PROGRAMS

EACH SATURDAY AND SUNDAY you are invited to explore the world of natural history at Field Museum. Free tours, demonstrations, and films related to ongoing exhibits at the Museum are designed for families and adults. Listed below are some of the numerous activities offered each weekend. Check the activity listing upon arrival for the complete schedule, and program locations. The programs are partially supported by a grant from the Illinois Art Council.

November

22 1:30pm *Surprise Safari*
Trek through the four corners of the Museum to see the seven continents. See antiquities from the Amazon, big game from Africa, and seals from the Arctic.

December

10 12:30pm *Surprise Safari*
Trek through the four corners of the Museum to see the seven continents. See antiquities from the Amazon, big game from Africa, and seals from the Arctic.

10 1:30pm *"Tibet Today" and "Bhutan, Land of the Thunder Dragon"*
See Lhasa and other towns now open to tourists, and examine important Buddhist sites during this slide lecture and tour.

 These programs are free with Museum admission and tickets are not required.

Klaus Baer

1930-1987

This special issue on the new Egypt exhibit is dedicated to Klaus Baer (June 22, 1930-May 14, 1987), a great Egyptologist and a truly wonderful person who, in one of his final activities before a most untimely death, served as adviser for the project "Inside Ancient Egypt." His assistance and counsel were seminal for the development of the mastaba of Unis-ankh, especially in the early stages of the project, when it passed from the drawing boards to actuality. It was with his approval and encouragement that we decided to install windows and a *serdab*, or statue chamber.

Klaus Baer was born in Halle, Germany. Fleeing the emerging Nazi movement, his parents emigrated to the U.S. in 1933. After receiving his BA in Greek from the University of Illinois (1948), Klaus Baer entered the graduate Egyptology program at the University of Chicago, receiving his Ph.D. in 1958. For six years, he taught at the University of California at Berkeley, before returning to the University of Chicago in 1965 as associate professor. Named full professor in 1970, he served as chairman of the Department of Near Eastern Languages and Civilizations 1972-76 and later as president of the American Research Center in Egypt in 1981-84. He earlier conducted research in Egypt as a Fulbright Scholar (1952-54) and again at Hierakonpolis (1969-70).

All stages of ancient Egypt fascinated him, from Early Dynastic to Coptic, and he had mastery over all. He performed valuable chronological research and wrote a basic study of the Old Kingdom, *Rank and Title in the Old Kingdom*. In addition, he wrote a work on Coptic, a study of the final phase of pharaonic culture and language. He also taught during this time, and it is in his students that a true appreciation of his greatness rests. Another measure of Klaus Baer's scope was his community involvement. When he spent summers in Colorado he served as a board member of the Rocky Ridge Music Camp in Estes Park. In 1985 he married Miriam Reitz, who survives him.

The exhibit developer, Janet Kamien, and I will long have a clear image of our last meeting with Dr. Baer, in April 1987, as we joined him at Edwardo's restaurant in Hyde Park to discuss the mastaba design. A little more than a month later, Klaus Baer had joined Unis-ankh and a host of others as a venerable spirit.

—Frank J. Yurco

Left: Coffin and mummy of Chenet-aa, Dynasty XXII. Right: Coffin of Nes-Pa-Sebek, Dynasty XXI-XXII. Ron Testa and Diane Alkazian for White 11/727

Welcome to Ancient Egypt

by Susan Nelson

And welcome to the Field Museum's new exhibit, "Inside Ancient Egypt." By 1993, when the Museum celebrates the beginning of its second 100 years, there will be a series of these major, theme exhibits that present the Museum's collections in new, challenging contexts. Each, like this one, will use a variety of innovative approaches to show the diversity of the collection as well as to appeal to the diversity of Museum visitors.

"Inside Ancient Egypt" is a dramatic display of the Field Museum's priceless collection of Egyptian artifacts. Some, like the mummies, you may already know. Others have not been seen for years. Even the best-known of the items will take on new significance in their new settings, which were researched and created by Janet Kamien, chair of Design and Production, and her staff.

"Inside Ancient Egypt" presents Egypt in two specific, newly defined ways: as a country that showed remarkable continuity as it evolved over more than 3,000 years of pharaohs, and as a place whose day-to-day activities had more than a passing resemblance to our own. Familiar treasures are again on display—but they are shown to tell parts of a story, rather than as unrelated specimens.

As you walk through Stanley Field Hall from the north entrance of the Field Museum toward the beginning of the new Egyptian exhibit, you may notice a slight change in the way the hall itself feels. The change is intentional: It is hoped that the vast, skylighted, two-story courtyard will begin to assume the role of a town square, an open area for gathering and meeting before moving on to the activities that take place off the square, in the arcade-like areas beneath the arches.

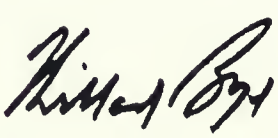
Susan Nelson is a freelance writer and editor with a special interest in ancient cultures. For this issue on ancient Egypt she prepared the tables and sidebars on pages 8 (dynasty dates, glossary), 9 (words with Egyptian roots, personal names), 10 (quiz, gods and goddesses), 27 (Egyptian firsts), and 29 (dioramas). She also wrote the basic text for the time line, pp. 16-17.

Field Museum Members and Friends—

"Inside Ancient Egypt" takes us back to the beginnings of the Field Museum, when Edward Ayer, the Museum's first trustee president, had the vision to acquire our Egyptian collection. He began collecting Egyptian materials in 1894, relying on his generous friends in Chicago for the funds to buy the extraordinary things, in the field and in marketplaces. You will learn more about the important collection Ayer acquired as you read the following pages.

But you will learn the most about ancient Egypt when you come to visit "Inside Ancient Egypt," which tells the story of the complex world of the Egyptians from 5,000 B.C. to A.D. 300. "Inside Ancient Egypt" is a thematic exhibition, which presents an exceptional collection in the context of a cultural and physical environment.

"Inside Ancient Egypt" results from the extraordinary contemporary vision of Michael Spock, vice president for Public Programs. It has been brought to life by the imaginative and tireless efforts of an exceptional exhibit team headed by Janet Kamien, chairman of the Design and Production Department. It is made possible by the generosity of the many donors of unrestricted gifts to the Field Museum's capital campaign for Centennial Directions, directed by Thomas R. Sanders, vice president, Development, and by the Field Foundation of Illinois, Inc., which helped fund the Egyptian marketplace; the Sara Lee Foundation, which funded the Bastet shrine; and the Helen Brach Foundation, which contributed to the animal niche cemetery. These generous gifts were magnanimously matched by the people of Chicago through their Chicago Park District.



Willard L. Boyd
President

Bronze statue of Osiris, King of the Afterlife and Lord of All
Dynasty XXVI (589-570 B.C.) Ron Testa 110649

egyptian dynasty dates

period	dynasties	dates
Early dynastic	1st and 2nd	3100-2755 B.C.
Old Kingdom	3rd-8th	2755-2230 B.C.
First Intermediate	9th-10th	2230-2040 B.C.
Middle Kingdom	11th-12th	2040-1786 B.C.
Second Intermediate	13th-17th	1786-1567 B.C.
New Kingdom	18th-20th	1567-1085 B.C.
Third Intermediate	21st-24th	1085- 712 B.C.
Late Period	25th-30th	712- 332 B.C.

Those arcade areas are the sites for such informal exhibits as "Sizes" on the first floor and "Rearing Young" on the second floor. These exhibits are planned to be changed and updated relatively often; their purpose is to engage visitors quickly in hands-on, topical exhibits and programs in brightly lighted, playful, even noisy settings.

Deeper within the Museum will continue to be the more comprehensive exhibits. These, following the lead of "Inside Ancient Egypt," will draw heavily on Field Museum's outstanding collections and will be arranged as carefully designed environments that include controlled lighting, sound, and climate. Like the Egyptian exhibit, they, too, will make use of models, dioramas, interactive experiences and activities, specially written label copy (or captions), and habitat groups.

Each will be planned to appeal to a number of different levels of interest of visitors. And again, as with the Egyptian exhibit, each will offer visitors a chance to explore the topic in more detail. In this way, it is possible to edit collections to keep an exhibit lively and yet make more detailed information available in nearby resource centers that contain in-depth information and up-to-date announcements about a specific area.

In the past four years, the Field Museum has redefined its mission. It has divided its emphasis into a research institute, with continuing work by curators in such areas as Central and South America, and

a glossary to ancient egypt

amulets. Good-luck charms or talismans, worn singly or in groups, believed to have magical qualities that could protect against physical and mystical events.

ba. The wandering part of the spirit, which at death could leave the body and move from the tomb to the living world as it wished.

ka. The part of the spirit of the deceased that remained with the owner's body, or in the *serdab* statue, in case the owner's mummy should be destroyed.

Book of the Dead. The name for the collection of hieroglyphic texts that were written on a papyrus roll and buried with the deceased in order to function as a guide for the journey in the afterlife.

canopic jar. A pottery or stone urn, one of a set of 4, with lids shaped either in human form, or like a jackal, baboon, or falcon, that held the liver, lungs, stomach, and intestines of a deceased person and was buried in a chest beside his or her mummy.

cartouche. An oblong enclosure with rounded ends and a tie that surrounds and protects the name in hieroglyphs of a ruler. Used today in gold or silver jewelry, with the wearer's name.

cubit. Commonly used measure of length; about 20 inches (from the tip of a pharaoh's longest finger to his/her elbow).

deben. Commonly used measure of weight used in trade; about three ounces (90 grams). Divides into 10 *kité.*

faience. A paste made of ground quartz or sand, with mineral additive; baked like clay, to produce multi-colored glazes.

false door. The painted or carved representation of an elaborate door in a tomb chapel through which the deceased's *ba* could enter and leave; in Unis-ankh's tomb, the false door weighs 12,000 lbs. The *ka* could receive offerings placed before the false door.

heart scarab. The Egyptians left the heart in the body because they believed it was the seat of intelligence. In the pharaonic period it was accompanied by a *heart scarab,* a large representation of a scarab beetle, usually of stone, that frequently was inscribed with chapter 30A of the Book of the Dead. This chapter is the text prayer, asking that the heart not testify against its owner in the great judgment of the deceased before the 42 assessors, and later, before Osiris himself.

hieroglyphs. The pictographic and phonogrammic script that was used to write ancient Egyptian; 24 hieroglyphs comprise the basic alphabet.

kité. Unit of weight. One-tenth of a *deben,* used in silver and gold units for evaluation, but not in copper.

mastaba. Rectangular tombs clustered around royal pyramids, where family members, nobility, and court attendants of the Old and Middle Kingdoms were buried. *Mastaba* means "bench" in Arabic because these ancient structures resemble modern Egyptian benches.

oracles. Statues of deities generally carried in boat-shaped shrines, which the bearers moved to indicate "yes" or "no" in response to questions. Some were stationary and were fashioned with a movable tongue, manipulated by a concealed priest.

papyrus. Nile River swamp reed whose pith, when sliced into strips and laid into sheets in overlapped, crossed layers, and, pressed and dried, formed a strong writing material for hieroglyphs. Sheets were often pasted together to form a roll, or scroll.

sarcophagus. Outer container usually of stone within which a coffin or coffins and mummy were placed for burial. Often decorated with images of the sky goddess or of Osiris (or his totem), it functioned as a regenerator for the resurrection of the deceased person within.

serdab. A small room with a small, slit-like "window" in a tomb to safely hold a statue of the deceased, which would ensure that the *ka* and *ba* would not have to die a second, permanent death, should the mummy perish.

stela. Inscribed stone slab that served to memorialize the dead or commemorate an event or a decree.

"cippus" stelae. Sculpted and inscribed stones, with prayers and an image of Horus as a child standing on crocodiles; they were carried for protection by travelers and children. Larger ones were placed so they could have water poured over them.

ushabti. A statuette often inscribed with chapter 6 from the Book of the Dead (spell 472 of Coffin Texts) and placed in the tomb to perform work on behalf of the deceased in the afterlife. The name means literally "I am one who answers."

common english words whose roots go back to ancient egyptian

Egyptian	English
hbny	ebony
djba	adobe
komyet	gum
sak	sack
hrere	lily
hībey	ibis
boinu	phoenix
Hi-ku-Ptah	Egypt
kemet	alchemy
amōn	ammonia

a public museum. (The Natural History Museum in London follows the same division of focus.) This approach, as guided by Museum president Willard L. Boyd, who is president emeritus of the University of Iowa, makes the Field Museum itself a place to enjoy and also to learn.

Michael Spock, vice president for Public Programs, has divided the public museum into three tiers—informal exhibits, thematic exhibits, and resource centers—in order to make the Museum more approachable. Following such a plan also allows the Museum to present its collections, which are its most valuable aspect, so that they do the one thing public television cannot do: give those who see them the authenticity that only face-to-face viewing of an object can give.

Text continued on p. 14

personal names from egypt

Some of the names given to people living in ancient Egypt, particularly during the New Kingdom's 18th and 19th Dynasties (1500-1200 B.C.), found their way into neighboring territories controlled by Egypt. Some also found their way into the Bible. Those that follow are still recognized today.

Egyptian name	Pronunciation	English name	Other cultures variations	Meaning
Msw	"Moje"	Moses	Moishe (Hebrew)	"to be born"
Pz-Nhsy	"Panehsy"	Phineas	Phineas (Hebrew)	"the Nubian"
Ssnw	"Seshenu"	Susan	Shoshana (Hebrew)	"lotus flower"
Sth	"Sutekh"	Seth		(a divine name)
Wnn-Nfr	"Wennefar"	Humphrey	Onnophrios (Greek) Onnofre (Italian, Spanish)	"The good being" (the epithet of Osiris)

ANCIENT EGYPT

[1]Saqqara—Site of Unis-ankh's mastaba tomb. This tomb is the centerpiece of Field Museum's "Inside Ancient Egypt" exhibit.

[2]Dahshur—Excavation site of King Sen-Wosret III's pharaonic boat featured in "Inside Ancient Egypt."

[3]Cairo—Modern capital of Egypt.

[4]Memphis—Ancient capital of Egypt.

test yourself about ancient egypt

Are the following statements true or false? Circle your choices and then look at the answers, which follow. The answers may surprise you.

1. Ancient Egyptian police trained cats or dogs to help them apprehend criminals. T or F?
2. The ancient Egyptians traded wood, oils, spices, and incense for the products they didn't have in Egypt. T or F?
3. Gold, silver, and copper were widely used, but the Egyptians did not use them for coins. T or F?
4. Burial rituals and mummification prove that the ancient Egyptians considered death the highest honor possible. T or F?
5. Tomb reliefs in ancient Egypt were generally painted in bright colors. T or F?
6. Only royalty were mummified in ancient Egypt. T or F?
7. Cleopatra was a sex goddess who ruled ancient Egypt by distracting people with her looks. T or F?
8. The pyramids of ancient Egypt were built by slaves. T or F?
9. Beer was the beverage of the ordinary people in ancient Egypt. T or F?
10. The Rosetta Stone is famous as a giant, rose-carved pendant of jade that was worn by Néfertiti. T or F?

ANSWERS

1. False. Ancient Egyptian police used baboons to help them catch criminals. Baboons are easy to train because they are so intelligent. They have a good sense of smell and see very well, they can run fast, and they are strong, whether they hang on with their human-like hands or with their very sharp teeth.

2. False. The usually dependable floods of the Nile made it possible for the ancient Egyptians to plant and cultivate wheat and barley, flax for fabrics, and vegetables and fruits; often there was a crop surplus. These agricultural products, along with gold and gems in later periods, were traded for such foreign products as woods, oils, and incense.

3. True. While metals were indeed mined in ancient Egypt, copper, gold, and silver were carefully monitored by both government and temple supervisors. Coins were not minted. Produce, and manufactured products, as well as raw metals and metal objects were commonly bartered, but were evaluated in terms of bronze, silver, or gold.

4. False. The ancient Egyptians, believing they had to take their wealth with them, created increasingly elaborate burial rituals in order to prepare themselves for life after death—in the style to which they had become accustomed during their lives on earth. They enjoyed life so much that they wanted it to continue forever.

5. True. The passage of time and the erosion of the bright colors suggest—incorrectly—that tombs were only sculpted, and not painted as well. The same is true of temples.

6. False. While kings, queens, and their immediate families and trusted servants were mummified at first, the practice of mummification passed onto noblemen and their families and gradually to the general population—including the Greeks and Romans who came to conquer ancient Egypt.

7. False. In fact, there was not one Cleopatra but seven, each married to the Pharaoh Ptolemy of her generation. The seventh and last Cleopatra was an extremely ambitious politician—she even dressed as Isis to woo the populace. She was engaged to marry Julius Caesar and bore him a son; in 34 B.C. she married Mark Antony; then, rather than face humiliation, took her life when they were defeated by Octavian in 31 B.C.

8. False. The pyramids of ancient Egypt were built by skilled construction workers who followed instructions of master architects. The men who hauled the blocks were farmers, out of work during the inundation season, organized into work gangs and paid by the government.

9. True. Beer was the most common beverage for everyone in Egypt. Barley, from which it was made, was plentiful for breads and cakes, as well. Wine was used mainly by the upper classes.

10. False. The Rosetta Stone, a large tablet of black volcanic basalt, made it feasible for the hieroglyphs of ancient Egypt to be translated. The stone, found in 1799 in the western delta city of Rosetta by an officer in Napoleon's army, contained priestly tribute to one of the pharaohs of the Ptolemaic-Roman Period. The inscription was in two languages and three scripts: Egyptian, in hieroglyphs and the cursive Demotic, and in Greek. By cross-translating from Greek and the Demotic characters, the French scholar Jean Francois Champollion, who was fluent in Coptic, broke the secret of the hieroglyphs.

egyptian gods and goddesses

The deities of ancient Egypt were many. They could manifest themselves in any form they chose and were frequently interchangeable: seventy-six different forms of the sun god are known. The following list is a guide to some of the major deities represented in "Inside Ancient Egypt." They are grouped, where possible, into family triads.

Amun (also Amen). God of the air, great god of Thebes, defender of the oppressed; husband of Mut, father of Khonsu. In New Kingdom Period, all deities were believed to be aspects of him, expressed also in the trinity: Amun, Re, and Ptah; he was believed also to be universal god.

Mut. Goddess of heaven, sorceress, mother of all living things; mother of Khonsu.

Khonsu. God of the moon, a great healer.

Atum. Creator god, who created earth from the inundation and all other deities as well as mankind, in male and co-equal female form.

Nut. Sky goddess whose curved body formed the arch of heaven. It was believed that daily she gave birth to the sun and nightly to the moon.

Geb. God of earth, brother and husband of Nut.

Osiris. God and ruler of the dead, god of the resurrection, of harvests, and bringer of civilization; husband of Isis, father of Horus.

Isis. Mother goddess; mother of Horus and great worker of magic who resurrected Osiris after he was murdered. Patroness and protectress of women.

list continued on p. 13

...FROM OUR GIFT CATALOG

THE STORE
FIELD MUSEUM OF NATURAL HISTORY
CHICAGO

Show your support of the Museum by giving gift certificates that may be used toward purchases in the Museum's gift stores, for educational programs or museum memberships. Available in the following denominations: $5, $10, $15, $20, $25, $50. Each certificate is enclosed in a handsome gift card.

To order by telephone call:
312/922-9410 ext. 236
Mon.-Fri. from 10-4

Custom Cartouches

Personalize a cartouche with your name in hieroglyphics. Allow 6-8 weeks for delivery. Christmas order deadline: November 10th.

Sterling Silver Cartouche
$45.00 (Member $40.50)
14 kt. Gold Cartouche
$175.00 (Member $157.50)

Cats, Cats, Cats!

Cats were sacred to the people of the Delta from predynastic days. Our collection captures the grace and elegance of the Egyptian cat.

Brass Egyptian Cat
Height 15½"
$55.00 (Member $49.50)
Our Own Cat With Kittens
Height 3½"–Base metal with antique gold finish
$32.00 (Member $28.80)
Cat Bast
Height 5½"–Solid cold cast bronze and richly patinated
$30.00 (Member $27.00)

Museum Shirts

Commemorate the opening of the tomb of Unis-ankh and the re-opening of the permanent Egyptian collections with our colorful shirts.

Unis-ankh T-Shirt
Adult sizes (S-M-L-XL)
$10.00 (Member $9.00)
Children sizes
(6-8, 10-12, 14-16)
$8.00 (Member $7.20)
Gem Hall Sweat Shirt
Adult sizes only
(S-M-L-XL)
$25.00 (Member $22.50)
Souvenir Sweat Shirt
Adult sizes (S-M-L-XL)
$18.00 (Member $16.20)

Unis-ankh Mirror

Adapted from the stones of the false door located in our newly installed mastaba of Unis-ankh, this mirror frame has been cast in rose limestone finish.

Unis-ankh Mirror
6¼" x 13¼"
$45.00 (Member $40.50)

Nefertiti

Nefertiti means "the beautiful one is come." Wife of King Ankhenaton, King Tutankhamen's father, ours is reproduced in polymer and hand detailed like the original in Berlin.

Nefertiti
11" high
$85.00 (Member $76.50)

Coffin and mummy of child, from coffin 30019. Ron Testa and Diane Alexander White. 110661

(continued)

egyptian gods and goddesses

Horus. (Hor-pa-khered as a child), protector of pharaoh, god of light and the sky; protector against poisons, dangerous creatures, and the evil eye; avenger of his father; was blinded temporarily by his uncle, Seth.

Seth. Elder brother of Osiris, husband of Nephthys; jealous of Osiris, Seth murdered him and fought with Horus for the kingship; god of the desert, wasteland, and the trickster figure.

Nephthys. Sister of Osiris, Isis, and Seth; married to Seth. In revulsion, she left Seth and joined Isis to help raise the young Horus and to help bury Osiris.

Ptah. Principal god of Memphis, patron of craftsmen; husband of Sekhmet.

Sekhmet. Savage lioness and the hostile aspect of Bastet; could protect doctors and healing but enjoyed her bloody mission, defined by Re: punish humanity by causing fevers, plagues, sandstorms.

Anubis. Jackal-headed god of the dead and of embalmers, who oversaw mummification and performed the "weighing of the heart" that judged a person's soul; husband of Ma'at.

Ma'at. Goddess of truth, justice, and order, who wore an ostrich feather on her head. In judgment of the dead, the deceased's heart was weighed against her feather.

Aten. Manifestation of the sun god in the aspect of the sun disk.

Bastet. Cat goddess of the city of Bubastis in the Nile Delta; strong, fertile, agile as a cat, she also represented the warm, life-giving sun and was the alter-aspect of Sekhmet.

Bes. Protected women, children, and the household. He is a grotesque, dwarf-shaped figure with lion's ears and wearing the lion's pelt.

Heqat. Goddess of fertility and birth. Shaped like a frog.

Min. God of fertility. Depicted as a male in mummy wrappings, with phallus erect and one arm raised, holding a flail.

Re (Ra). Sun god of Heliopolis; most commonly invoked of the many forms of the sun god. In his daily voyage across heaven, he was Khepri in the morning, Re at mid-day, and Hor-akhty at sunset.

Thoth. Ibis-headed god of writing and writers; scribe of the gods. Could also be manifested as a baboon or as the moon.

To Those Who Made "Inside Ancient Egypt" Possible

The Field Museum is deeply indebted to the following persons and organizations responsible for the funding, the planning, the construction, and the myriad of creative activities that collectively produced this extraordinary exhibit.

Funding. This project was funded in part by a grant from the National Endowment for the Arts, a Federal agency. Funding was also provided by Sara Lee Foundation, Helen B. Brach Foundation, and the Field Foundation of Illinois, Inc.

Exhibit Production. Mark Staff Brandl, Peter Crabbe, Neil Keliher, Randolph Olive, Gerald Struck, Daniel Weinstock.
Daniel Brinkmeier, Mary Brogger, Paul Brunsvold, George Chavez, Edward Correll, Robin Faulkner, James Komar, Ray Leo, Harvey Matthe, Scott Mattera, Brian Sauve, Gary Schirmer, Vincent Shine, William Skodje, Jeffry Wrona, Jameil Al-Oboudi, Howard Bezin, Brian Cavanaugh, Lawrence Degand, Joseph Doherty, Pamela Gaible, Daniel Geary, Terry Gibson, Matthew Groshek, Patricia Guizzetti, Jessica Haynes, Mary Jo Huck, Wendy Jacob, Douglas Jewell, Dennis Kowalski, Mary Maxon, Dion Miller, George Monley, Michael Paha, David Potter, Michael Rudlich, Mykl Ruffino, John Russick, Librado Salazar, Beverly Scott, Joseph Searcy, Bruce Scherting, M. Nicolas Silva, Michael Slaski, Rodney Stockment, Henry Tucker, Jack Voris, Robin Whatley, Gregory Williams, Cameron Zebrun.

Exhibit Design. Lisa McKemin, Uriel Schlair.
Michael Brehm, Jane Cuthbertson, Donald Emery, Dianne Hanau-Strain, Lynn Hobbs, Raj Louisnathan, Paul Martin, Sandra Quinn, William Skodje, Robert Zimmerman.

Exhibit Development. Calvin Gray, Janet Kamien, Frank Yurco.
Eileen Campbell, Carrie Hageman, John Paterson, Judith Rand, Michael Rigsby, Marvin Ronning, Judith Spock, Michael Spock.

Exhibit Advisers. Klaus Baer, Bennet Bronson, William Burger, John Foster, Mark Lehner, Thomas Logan, Robert Rittner, Robert Steinbach, Edward Wente.

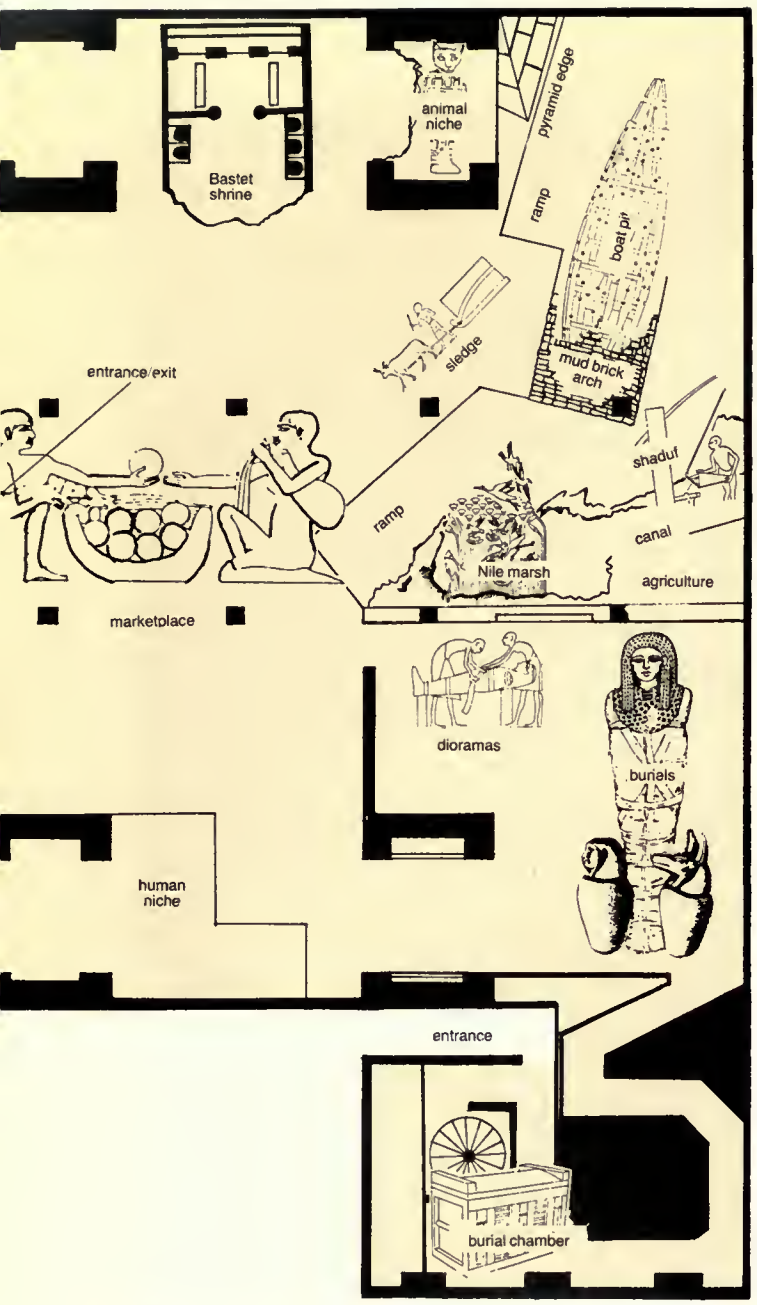
Conservation and Collections Management. Christine Gross, Catherine Sease.
Christine Del Re, William Grewe-Mullins, Sheryl Heidenreich, Lanet Jarrett, Jeanne Mandel, Karen Poulson, Janet Miller, Beth Scheckman.

Photography. June Bartlett, Nina Cummings, Margaret Sears, Ron Testa, Thomas Van Ende, Sophia Anastasiou Wasik, Diane Alexander White.

Contractors. Belding Corp., Builders Architectural Products, Inc., Aquilla Cohran, Cost of Wisconsin, Inc., Harry Weese & Assoc., Hayes-Gallardo, Jamerson Electrical Contractors, Inc., Laura Lundeen, Inigo Manglano-Ovalle, Mohawk Electric Construction Co., Stevens Exhibits, Wahlburg Construction Co., Ron Wing.

Special Thanks to Glen Cole, Zorica Dabich, The Epigraphic Survey, Chicago House, Egypt, The Egyptian Antiquities Organization, Dr. Ahmed A. Fareed, Hugh Hamill and the Security Staff of Field Museum, Ron Hall, Janet Johnson, Ursula Kaplony-Heckel, Walley Keifer, Phillip Lewis, Charles Ortloff, Bruce Patterson, Phyto Farms of DeKalb, Inc., Lisa Plotkin, Norman Radtke, David Reese, Fattah Mohammed Sabbahy, Cindy Salvino, David Schultz, Daniel Summers, David Willard, Edward Yastrow, Mohammed Zayed, and Thomas R. Sanders who directed fund-raising activities.

Contributors. Fritz Bishop, Greg Brinkmeier, Harold Brinkmeier, Cargill Corporation.



Continued from p. 9

Unis-ankh's Tomb

"Inside Ancient Egypt" begins with exactly this sense of immediacy. Just past the introduction to the exhibition, off Stanley Field Hall, is the entrance to the tomb of Unis-ankh, the first of eight major sections of the exhibit. Unis-ankh was a nobleman who was buried in Saqqara, in the area of Egypt where sands and dry climate helped to preserve tombs and pyramids. Although his age and cause of death are not given, Unis-ankh is assumed to be the son of King Unis, last pharaoh of the 5th Dynasty, or ruling family, of Egypt (2428-2407 B.C.). In hieroglyphs, Unis-ankh is described as "King's son, unique courtier, overseer of Upper Egypt, first one under the King, priest of Truth, Unis-ankh." The glyph-carved limestone chapel rooms and the false door were purchased by the Field Museum in 1908. As they are now installed, they exactly replicate the tomb as it was discovered in the desert.

The series of rooms illustrates the lengths to which the Egyptians went to prepare for life after death, a practice that began with the pharaohs and, over the next three thousand years, spread to anyone who could pay the price for mummification and a special burial spot. Unis-ankh's *mastaba*—the word is Arabic for "bench," which such tombs were said to resemble when they began to be excavated in the 1800s—contains the sorts of objects a king's son might have wanted in the afterlife, rooms where priests could make offerings, and a *serdab* statue to give a home to his *ka* spirit, in the event that his mummy was destroyed.

A stairway leads to the roof of the tomb, from which the sunlit courtyard may be seen. A circular

Funerary boat of King Sen-Wosret III, XIIth Dynasty, excavated at Dahshur Egypt in 1894. Ron Testa and Diane Alexander White 110745

staircase (or an elevator) leads down 35 feet to a reconstruction of the burial chamber, the second major area of the exhibit. The carved-stone sarcophagus is of the type that could have held Unis-ankh's mummy—if his mummy had been found.

Past the burial chamber are placed the sorts of objects that would have lured tomb robbers 4,500 years ago—and the confession extracted by torture of one of eight tomb robbers from ancient Egypt. It was riches the robbers had not been able to find that made the 1922 discovery of the tomb of King Tut-ankh-Amen (King Tut) in 1922 so incredibly valuable.

Burial Scenes

A group of burial scenes shows the careful planning that Egyptians followed during 3,000 years and 31 different ruling family lines, or dynasties, in order to prepare for an afterlife that would continue the pleasures of mortal life. Objects are arranged in chronological order.

These scenes reveal how great a role magic played in the religion of the ancient Egyptians. Many of the personal beliefs of the Egyptians were founded in spells and good-luck charms and supernatural powers. *Ushabtis* were miniature figures buried with a person that were believed to work for the deceased in the afterlife. Amulets were not only worn by the living, but they also were placed over the heart and over the entire body of a mummy. Mummies are shown in the exhibit's burial scenes, and so is a diorama illustrating the 70-day mummification process. Engraved stelae and even coffins were chosen to ensure a happy next life for the deceased.

Much Egyptian art was created to honor the dead or to paint the way from real life into the after-

Statue of the scribe Amenhotep, painted limestone, Dynasty XVIII. Cat. 88906. Photo by Ron Testa 110626

EGYPT THROUGH 7,000 YEARS

	EGYPT	EUROPE	THE AMERICAS	NEAR EAST	EAST ASIA
Present	Egyptian revolt in 750 helps oust ruling Umayad government and place Abbasids in power. In 969, Fatimids occupy Egypt and bring economic decline, famine, disorder. Salah-ad-Din, the great foe of Richard the Lion-Hearted, made governor of Egypt in 1169; by 1171, the Ayyubid Dynasty established. The Mamelukes, a group of former Turkish slaves, seize power and administer violent rule from 1250 to 1517, when Ottoman sultan Selim I conquers Egypt. Napoleon conducts his campaigns into Egypt in 1798. His success is short-lived: He is forced to evacuate by British Admiral Nelson in 1801. Albanian General Muhammed Ali appointed to govern Egypt in 1805. Two years later, he expels British and Turkish rule. In 1937 King Faruq (Farouk) ascends throne. 1952 army coup leads to his abdication; monarchy abolished. Gen. Muhammed Naguib becomes Egypt's first president in 1953; he is ousted by Col. Gamal abd-el-Nasser in 1954. Under Nasser's leadership, Suez Canal nationalized, Aswan High Dam built. Nasser dies in 1970, succeeded by Muhammed Anwar al Sadat. When Sadat is assassinated in 1981, his vice president, Hosni Mubarek, succeeds as president, the office Mubarek holds in 1988.				
700 A.D.	**Byzantine Period (323-641 A.D.).** Honorius, emperor of Constantinople, closes the temples of pharaonic deities, and Christian unity prevails. Arabs invade Egypt in the mid-1600s; under Muslim rule, Egyptian Christian and Jewish communities enjoy freedom of religion and relative prosperity.	Roman Empire falls in 476 A.D.	Tiwanaku states (Bolivia) and Wari states (central Peru) founded in So. America; Mayan cities flourish in Mesoamerica.	Arabs invade Syria in 633 A.D.	
300 A.D.	**Ptolemaic-Roman Period (332 B.C.-323 A.D.; 31st Dynasty).** Generations of Ptolemies and their sister-wives, each named Cleopatra, are benevolent though patronizing toward native Egyptians. Ptolemy II Philadelphus maximizes economic exploitation of natives. Cleopatra VII marries Mark Antony in 34 B.C.; they are defeated by Roman general Octavian in 31; she commits suicide the next year. Christianity established between 50 and 150 A.D., becoming dominant by 250 A.D. Alexandria becomes major center of Jewish culture.	Julius Caesar conducts expeditions to Britain in 55-54 B.C.	Moche culture develops along north coast of Peru. In Mesoamerica, city of Teotihuacan with its pyramid of the sun develops near what is now Mexico City. In North America, Hopewell culture of mound-builders spreads in what is now Ohio, Indiana, Illinois.	Romans conquer Syria and Palestine in 65 B.C.; Jesus of Nazareth born in 6 B.C. (6 B.C. according to modern calendar).	China consolidated under the Quin and Han Dynasties, forming empire as large and rich as that of Rome.
300 B.C.	Late Period (712-332; 25th to 30th	First Olympic Games in	Pukara state develops in		

	from 650 to 525 B.C.; when Persians conquer Egypt. Ousted in 404, Persians return in 343, then defeated by Alexander the Great. Then, Ptolemy I, one of Alexander's generals, founds Ptolemaic Dynasty.	golden age from 460 to 429; Greeks lend economic and military aid to Egypt.			
800 B.C.	**3rd Intermediate Period (1085-712); 21st to 24th Dynasties).** Egypt rules by priests and kings; Libyans able to assume power.	Homer writes *The Iliad* and *The Odyssey;* rise of the Greek city states in 850 B.C. Iron becomes common.	Chavin culture and maize agriculture spread to the coast from highlands of Peru.	David consolidates Israel, Solomon becomes king of Israel in 973; iron becomes common.	
1000 B.C.	**New Kingdom Period continues through 1085.** Ramesses III rules during 20th Dynasty. Egypt's military powers decline, tombs looted.	Agamemnon and his Greek army complete the siege of Troy in 1185.		Sea peoples ravage the area, destroying the Hittites and conquering Syria. Israelite kingdom emerges under Saul.	
1200 B.C.	**New Kingdom Period (1567-1085; 18th-20th Dynasties).** During Egypt's golden age, empire spreads. Hat-shep-sut rules early in 18th Dynasty. King Thutmose III, brilliant commander and administrator, succeeds her. King "Tut" rules also, as does Ramesses II.	Bronze common throughout continent. Volcano erupts on isle of Thera, creating waves that engulf Crete; Mycenae enjoys resurgence, replacing Crete; iron appears in SE Europe.	Olmec culture begins in Veracruz and Gulf coast in Mesoamerica; Cupic Nique culture begins along Peru's coast; Chavin culture starts in Peru highlands.		Shang Dynasty comes to power in China; bronze becomes common.
1500 B.C.	**2nd Intermediate Period (1786-1567; 13th-17th Dynasties).** Horse chariots, bronze, improved weaving introduced by Hyksos invaders.	Mycenaean civilization reaches peak in Greece.	Working of gold, silver, copper and smelting of copper ore are done in north and central Peru.	Hittites sack Babylon in 1595; Hurrians rule the Syrian states; iron appears for first time.	
1700 B.C.	**Middle Kingdom Period (2134-1786; 11th, 12th Dynasties).** Period of Prosperity, culture, reunification. Trade with Crete. King Sen-Wosret III reigns in 12th Dynasty. One of his funerary boats will be seen in Field Museum some 3,700 years later.		Large mud-brick and rock-rubble pyramids built along Peru coast.	Babylon flourishes under Hammurabi. Hittites invade and settle Anatolia; Assyrian kingdom founded.	
2000 B.C.	**Middle Kingdom Period (2755-2230; 3rd to 8th Dynasties).** Pharaoh Djoser builds first stepped pyramid and burial complex at Saqqara; great pyramids and Sphinx of Giza; religion based on sun god Re is dominant. King Unis, father of Unis-ankh, reigns in 5th Dynasty. Unis-ankh's tomb in Saqqara (built ca. 2400 B.C.) will be reconstructed in Field Museum 4,300 years later.	Work begins on Stonehenge; Greek-speaking tribes appear in Greece.	Pottery and fully developed agriculture spread along Peru coast.	City of Ebla flourishes in Syria, until defeated by Naram-Sin of Akkad. Mesopotamia in Akkadian period, followed by Gutian invasions and then Aramagan invasions. Troy region develops in Anatolia.	Indus valley civilization arises in India; copper is known in China and first cities are built there.
2500 B.C.	**Early Dynastic Period (3100-2755 B.C., 1st and 2nd Dynasties).** Upper and Lower Egypts unite under King Menes, who founds Memphis, near modern Cairo.	Europe now practices agriculture; writing and large cities do not yet exist; bronze used in S.E. Europe.	Temple structures ("pyramids") built along Peru coast; early pottery appears in Belize, Veracruz, Florida.	Mesopotamia, in Early Dynastic and Sumerian periods, sees development of codes of law and major cities.	
3100 B.C.	Small settlements develop into skilled farm communities. Contact established with Mesopotamia and Syria. Large towns and first kings appear around 3300 B.C.			Writing, on small clay tablets, is developed in Mesopotamia.	Large villages and agriculture become widespread.
3800 B.C.	Early settlements develop along Nile. Agriculture and herding, supplemented by hunting, fishing, become main livelihood.	Early settlements of farmers inhabit half the continent; primitive hunters inhabit the rest.	Early agricultural domestication of maize and beans in Meso and South America.		
5000 B.C.					

Published by Field Museum of Natural History, Roosevelt Road at Lake Shore Drive, Chicago, Il 60605-2496, Copyright © 1988 Field Museum of Natural History.

Replica painting by Inigo Manglano-Ovalle of marketplace scene from tomb of Ny-ankh-Khnum and Khnum-hotep at Saqqara. Photo by Ron Testa 111030

life. One of the Museum's rarest art objects is a statue of Sen-Mut, an architect and perhaps the lover of Queen Hat-shep-sut, who became pharaoh in place of her 10-year-old stepson, Thutmose III. In the statue, Sen-Mut cradles Hatshepsut's infant daughter, Neferu-Re.

Nile River Marsh

A brightly lighted recreation of a Nile River marsh appears at the end of the funereal exhibits and art. To the right is a stream with running water; positioned in and near it are fish, birds, plants, and animals that tomb reliefs tell us would have lived in ancient Egypt. A mural backdrop shows "the green and the brown" of Egypt—the lush floodplain where crops were abundant and the bone-dry desert. A *shaduf,* a simple lever device to lift water that is still in use in some parts of Egypt, is meant to be tried out.

The massive funerary boat on display opposite the Nile marsh was buried beneath a mud-brick arch and many feet of sand in the desert at Dahshur. It is one of four such boats that were excavated from the pyramid complex of King Sen-Wosret III in 1894. Two of the boats are in the Egyptian Museum in Cairo and the other is in the Carnegie Museum of Natural History in Pittsburgh. Behind the royal boat, opposite its burial arch, is a mud brick taken from the remains of Sen-Wosret III's pyramid.

Visitor Activity Area

An activity area invites visitors to learn a number of things firsthand about ancient Egypt. Members of the Museum's Hall Interpreters program, directed by Philip Courington, were trained about Egypt. They will help visitors try to move an enormous slab of rock on a sledge, as was done in constructing the pyramids;

polish a large limestone slab; calculate heights and weights in cubits and debens, respectively; figure out names in hieroglyphs; and make papyrus paper.

Animal Niche

One of the most eerie sections of the exhibit is the animal niche cemetery. Here, in individual crevices, are mummies of cats, falcons, and even a crocodile. Animal mummies, which were most common during the Late Period (712 to 322 B.C.), were used by worshippers as offerings to the specific, corresponding god or goddess.

Shrine to Bastet

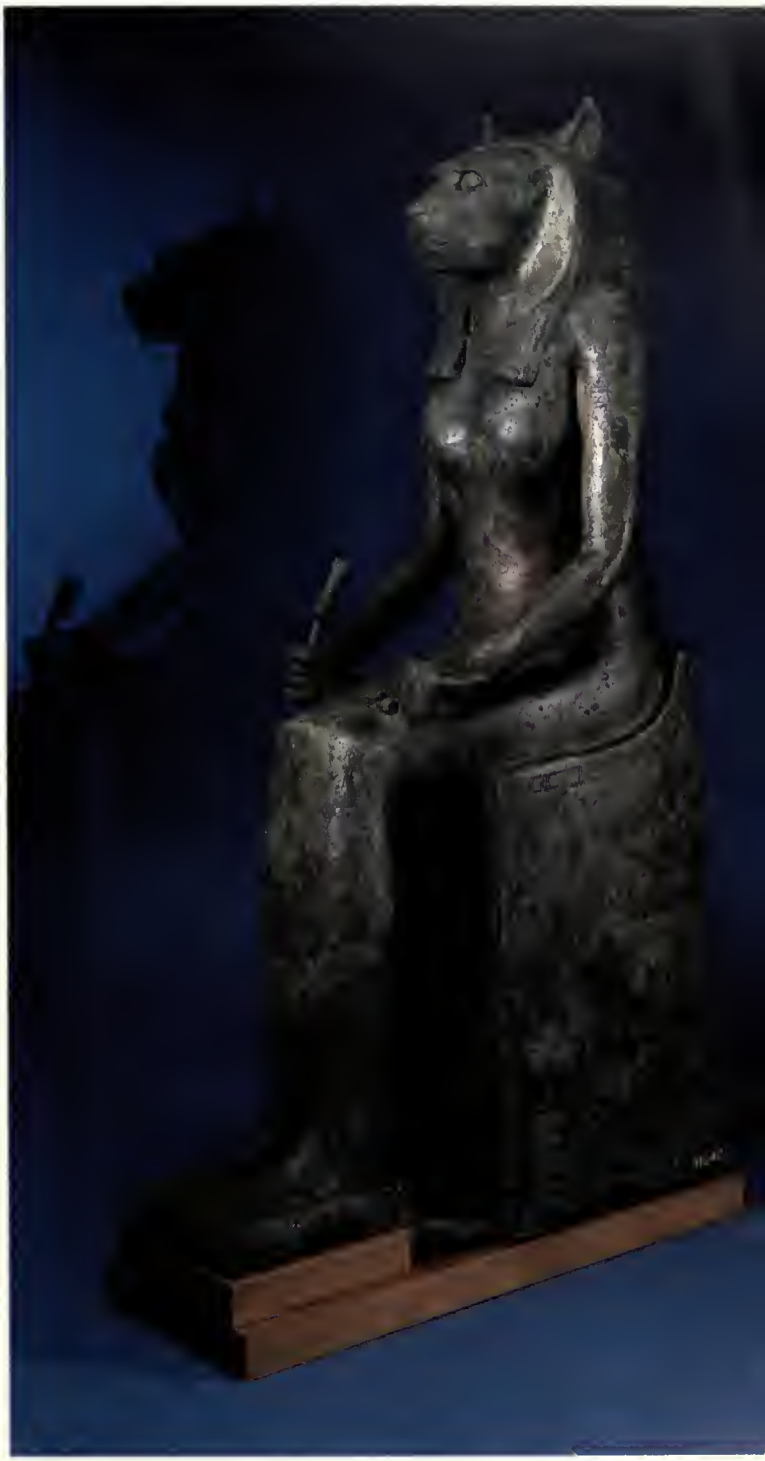
Cats played a significant role in the lives of the ancient Egyptians. The cat goddess, Bastet, represented the kindly, life-giving side of cat nature. "Inside Ancient Egypt" includes a shrine to Bastet as such a shrine might exist in an ancient town. Fresh flowers, incense, statues of Bastet and her savage counterpart, Sekhmet the lioness, and stelae dedicated to the gods are displayed; small benches of rock allow weary worshippers (or visitors) to rest.

Marketplace

Opposite the Bastet shrine is a large, lively marketplace. The market scenes are reconstructed from scenes on the walls of a tomb of two barbers, buried together about 4,500 years ago in Saqqara, near the tomb of Unis-ankh. In the marketplace are many examples of everyday life in ancient Egypt: the important role of scribes; the makeup and wigs and oils; razors; jewelry; and clothing (the lower classes and the very young wore little, if any). Vignettes further illustrate more about how these people of northern Africa lived, between 5,000 and 2,000 years ago. Included in the vignettes are children (they were obedient), crime and punishment (a hand for a thief; a tongue for "treachery"), the making of everyday foods (bread and beer), trading, and weaving.

Life for the peasants of Egypt was not easy. For the wealthy, life was quite easy and good. Yet, all Egyptians, rich and poor alike, loved life and wished to continue living forever. Hence the practice of preparing for the afterlife, which meant taking along objects prized in everyday life. A large collection of such objects concludes "Inside Ancient Egypt."

Just past this last section of the marketplace is the Museum's new Egyptian store, in which you may wish to purchase Egypt-related objects for your own everyday life.



Bronze statue of Bastet in the aspect of Sekhmet the Lioness. Dynasty XXVI (653-525 B.C.). Ron Testa 110530

The Egyptian Collection and

By Frank J. Yurco

From the day I first set foot in Egypt in 1974, the wonders of that ancient culture left a lasting impression on me, influencing the course of my life and leading in time to my own participation in Field Museum's historic new exhibit, "Inside Ancient Egypt."

This exhibit had been envisioned in 1981 during the partial renovation of the Egyptian Hall by then Assistant Curator of Anthropology Donald Whitcomb, who wrote in the November 1981 *Bulletin* that the goal of the project was "a reorganization of the artifacts of the Predynastic period and the Old Kingdom[1] centered around the tombs." He added, "It is our hope that this will eventually be followed by the reorganization of the entire Egyptian Hall with a progression of chronological sections and predominant cultural themes such as religion and politics." Six years later, this hope of Whitcomb and then Director (now Trustee) E. Leland Webber materialized, as Michael Spock, vice president of Public Programs; Janet Kamien, chair of Design and Production; and I began to develop "Inside Ancient Egypt."

To an Egyptologist, the quality of the Museum's Egyptian collection is readily apparent. Yet, the material is only now, with this stunning innovative exhibit, receiving the showcase it so richly deserves. The cornerstone of the collection was laid by Chicago industrialist Edward E. Ayer, whose initiative had also been crucial to the very founding of the Museum.* In 1894, Ayer, an avid, conscientious collector who had earlier brought together one of the finest assemblages of American Indian artifacts, saw Egypt for the first time, and there began his historic acquisitions from the land of the pharaohs. He developed an abiding interest in the culture, making several more visits during his lifetime.

From Cairo, on March 26, 1894, Ayer wrote Field Museum Director Frederick J. Skiff: "I have purchased about 20 mummies, all the mummy shoes, 25 canopic jars[2], a lot of wooden and stone images...and the best lot of Greek and Roman Bronzes that I believe ever left Egypt."

Ayer's assessment of the bronzes was not far off the mark; they are exceptional pieces indeed, including three that rank as undisputed masterworks: the seated leonine goddess Bastet-Sekhmet, a seated cat, and a large standing figure of the god Osiris. The last object is certainly a work of the XXVIth Dynasty, as the divinity's features resemble those of Pharaoh Apries. The seated Bastet-Sekhmet has its closest parallel in another bronze lioness, Wadjet, in the Cairo Museum, dated Dynasty XXVI. The seated cat is truly a majestic bronze sculpture, with richly detailed inlays of copper, gold, and silver.

Ayer's prominence in Chicago's business and social circles brought him in close touch with others of like persuasions, which further redounded to the advantage of the Egyptian collection. Among these friends was Martin A. Ryerson (1856-1932), a trustee from 1893 to 1932. Ryerson was a generous donor to the Field Museum collections as well as to those of the Oriental Institute of the University of Chicago. Ayer's association with the Cyrus McCormicks eventuated in the Museum's acquiring in 1900 one of its principal treasures, the funerary boat of King Sen-Wosret III, a XIIth Dynasty pharaoh. The boat had been excavated at Dahshur, Egypt, six years earlier, and is one of only six presently known full-size royal boats from ancient Egypt.

Ayer demonstrated remarkable foresight in his collecting style—eclectic yet purposeful; his acquisitions make it possible now to construct exhibits in a contextual arrangement, although in his day typological exhibits (*i.e.*, arranged according to type) were the vogue. In the case of the Dahshur boat, for example, Ayer also collected a mud brick and a set of pottery cups from the same pyramid complex. These seemingly mundane objects contribute invaluably toward establishing authentic context for the boat, and the brick has been useful in the creation of replica bricks of the vault representing where the boat was discovered. The boat has already served science notably: in the testing of radiocarbon dating. In 1950, Dr. Willard F. Libby of the University of Chicago's Institute for Nuclear Studies used a sample of planking from the boat to test his new carbon-14 dating method. The plank's age, according to Libby's test, closely agreed with the astronomically ascertained date of Sen-Wosret III's death in 1843 B.C. The boat's construction is of particular interest to Egyptologists as a prime example of fitting and joining technique developed in the Middle Kingdom period, as timber shortages reflected earlier overcutting and changes in climate.

In collecting mummies, Ayer also demonstrated a sense for exhibition value. The mummies, coffins, canopic jars, Books of the Dead, and ushabtis he collected are of different ages and periods, from Middle Kingdom through the Roman period. These materials have enabled us to create a chronological sequence of burial situations and to see how customs evolved. Thus, the exhibit's burial scenes are a continuation of the mastaba concepts, and also have a chronological framework, as envisioned by Whitcomb in 1981. Thanks to the acquisitions of Ayer and other donors, the Museum has some 30 complete coffins and/or mummies, and sufficient Ptolemaic-Roman mummies to permit replicating a segment of the catacomb-like cemeteries in Alexandria.

On a trip to Luxor, Ayer met the Oriental Institute's founder, James Henry Breasted (1865-1935), and on Breasted's advice acquired the Museum's statue of Sen-Mut holding Queen Hat-shep-sut's young daughter, Princess Neferu-Re. This statue, one of 28 known statues of this official, is the most perfect of all, with no damage beyond the ancient erasure of Sen-Mut's name by his political foes—a defect, which adds historic interest!

Among Ayer's earlier acquisitions are fragments of reliefs. Such fragments were commonly cut by dealers from monuments and sold piece-meal. One such fragment in the collection (cat. 31309), from the tomb of the IVth Dynasty overseer of the treasury, Mery, is a typical example. Contiguous segments of this same relief are scattered among four other museums in the

*For fuller treatment of Ayer's life see "Books, Business, and Buckskin," by E. Leland Webber, July/August 1984 *Bulletin*, p. 5.

1. For dates of historic periods see p. 8
2. For definition of special terms see glossary, p. 8

the Legacy of Edward E. Ayer

United States and Europe. In the process of this dispersal, segments were damaged, context was lost, and future Egyptologists had extra work cut out for them (as it were) in reestablishing continuities.

So in 1907-08, when Egypt's Antiquities Service decided to sell complete rooms of ancient chapels, Ayer seized the chance to acquire *complete* chapel rooms from two tombs—Unis-ankh's chapel from the pyramid complex of Pharaoh Unis, Vth Dynasty, and an earlier Vth Dynasty tomb chapel, that of Netcher-user. The Field Museum's space (then in the Jackson Park building) couldn't accommodate full display of these rooms, and later, in the present building, city fire department codes prohibited public access when they were installed (1928-32). In 1981, when the Egypt Hall (J) was partially renovated, a secondary access to Unis-ankh was created, within the city codes, but at the cost of access to the most intimate part of the chapel—the space in front of the false door. The basement location of Hall J also necessitated that the chapel be installed one foot too low. With the innovative design of "Inside Ancient Egypt," however, not only have these problems been surmounted, but the entire mastaba complex has been gloriously recreated.

Ayer's interest and dedication helped the Museum in yet another way. The assembling of a comprehensive Egyptian collection at the Field Museum attracted the interest of Sir William M. Flinders Petrie (1853-1942), founder of modern scientific Egyptian archaeology. At the turn of the century, Petrie was not only shedding new light on Predynastic Egypt through his excavations; he was also laying groundwork for scientific archaeology, which stresses the importance of complete documentation in preserving the context of a scientifically controlled archaeological find.

Petrie gave the Field Museum a basic set of Predynastic objects from both Naqada I (Amratian) and Naqada II (Gerzean). This included a Predynastic burial of a Naqada I period woman's body naturally mummified. Other objects included pottery, stone vases, and flint tools. This further demonstrated the scope of Petrie's vision—he wanted the results of his excavations to be exhibited so as to instruct the general public about the *context* in which the objects were found. In this respect, Petrie's philosophy also provided guidelines in planning "Inside Ancient Egypt." Our intention was to show objects in *contextual* displays rather than as *assemblages* of objects grouped by category.

Petrie's successors also donated valuable collections to the Field Museum. Dr. Elizabeth Seton-Karr gave a fine series of paleolithic to Predynastic flints; Dr. Gertrude Caton Thompson gave flints from her excavations in the Fayum A and B sites. Thus, the Museum's holdings on Predynastic Egypt now range from earliest times through the late Predynastic. Particular importance is now attached to these early materials as we recognize that a proper view of Predynastic Egypt is essential to understanding all subsequent Egyptian history.

Interestingly, Ayer's approach to collecting reflected in important ways Petrie's philosophy: in assembling a collection for the Museum, he did not go just for show pieces; he also

Edward E. Ayer

sought unprepossessing pottery fragments that were of interest because they bore inscriptions. These inscribed sherds, or *ostraca*, now shared between the Oriental Institute and Field Museum, provide records of everyday life around the city of Thebes in the Ptolemaic and Roman eras.

Just as we were installing the new exhibit, we were visited by a scholar of Demotic, Dr. Ursula Kaplony-Heckel, of Marburg, West Germany, who has found several of the Ayer ostraca to be documents reflecting a variety of commercial and legal transactions by Thebes citizens, including tax receipts, contracts for land and livestock, authorizations to cultivate land, even personal letters.

Ayer collected a fine Coptic collection as well—textiles, stone, bronzes, and pottery. This wide range of Coptic objects is one of the strengths of the Egyptian collection, with representation in virtually all periods and all types of objects—choice artworks down to simple holy water flasks in which Christian pilgrims carried water blessed by the Coptic monastery fathers.

A major, more recent addition to the collection was made in 1944 in memory of Helen Gurley. The Gurley family's extensive Egyptian collection, included scarabs, rings, and statuettes, as well as canopic jars and ushabtis. Most collectors dealing directly with antiquities dealers risked a hazard especially prevalent in Egypt—the danger of being sold fake or altered specimens. Ayer was able to avoid this problem in large part because he readily consulted with recognized scholars before buying; but he was also gifted with a keen eye, despite no formal training in Egyptology.

The Field Museum's Egyptian collection owes Edward E. Ayer a debt that is beyond measure. Without his foresight, his dedication, his generosity, "Inside Ancient Egypt" would never have come to pass.

Frank J. Yurco, consultant for "Inside Ancient Egypt," is a doctoral candidate in Egyptology in the Department of Near Eastern Languages and Civilizations of the University of Chicago.

Basalt head of unknown man. Early Roman Period (50-100 A.D.) Ron Testa 110712

Behind the Scenes:

The Unseen Side of "Inside Ancient Egypt"

by Susan Nelson

Planning and assembling an exhibition as large as "Inside Ancient Egypt" takes money and time—in this case, some $2.2 million and nearly two years of planning. But two years is formal time, on paper. The detailed work that created "Inside Ancient Egypt" also began to take over the workdays and after-hours thoughts of involved Field Museum staff members many months before the exhibition opened. By early fall of this year the anticipation and the extra hours had begun to create a crackle of excitement that

Conservators Cap Sease and Christine Del Re with Egyptology consultant Frank Yurco examining coffin and mummy in conservation lab. Ron Testa and Diane Alexander White 111068

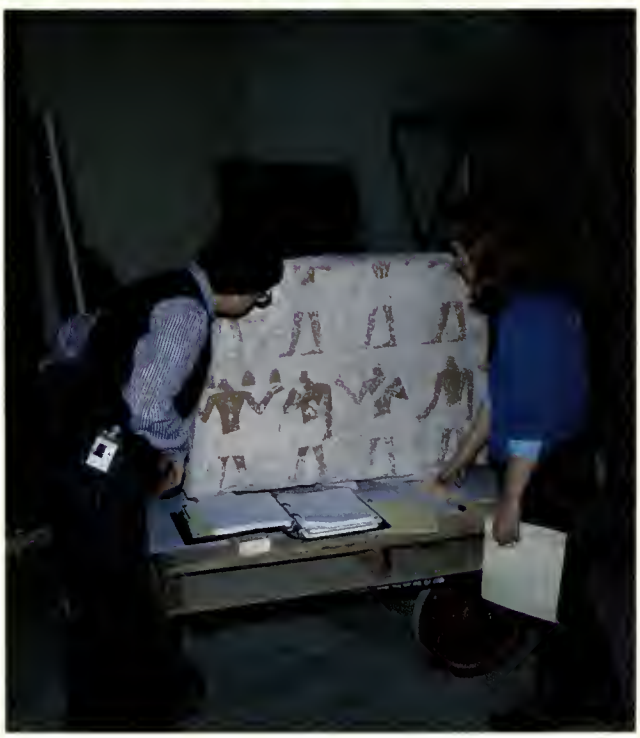
Janet Kamien, chair of Design and Production, with Egyptology consulting adviser Mark Lehner, near site at Saqqara, Egypt in 1988, where Unis-ankh tomb chapel was excavated in 1908.
Copyright © Margaret Sears.

everyone who worked in the Museum, as well as curious visitors, could notice.

On page 28, Robin Faulkner and Nina Cummings describe the tedious planning—and latter-day considerations for an irreplaceable marble floor—that resulted in the decision to move the six-ton false door to Unis-ankh's tomb the same way it had been moved 4,000 years ago: with logs that would be rolled slowly forward.

But, while a pre-wheel technique was the best way to move the door, state-of-the-art advances were needed to protect mummies and other antiquities while they are displayed in settings that will let people see them more clearly than ever before.

Specifically, the new burial niches and many of the exhibit artifacts are illuminated by a remarkable rigging of "pipe lights," a unique lighting system that directs and bends light through PVC pipe from the light source to the exact location where light is wanted. The pipe is lined with a newly developed film from 3M Corporation which bounces the light down



Cap Sease and Robin Faulkner examine block from Unis-ankh chapel. Nina Cummings 110601

Preparators James Komar (r.) and Daniel Brinkmeier painting the Nile-marsh habitat diorama. Diane Alexander White 111058

Robin Faulkner paints replica relief in Unis-ankh tomb chamber. Ron Testa and Diane Alexander White 111062

Preparators Mary Maxon and John Russik preparing mount for a stela. Diane Alexander White 111061

the pipe, without diffusion, to the point where the light is finally focused and aimed with a mirror onto the artifact. Designer Paul Martin devised the system which piqued the interest of representatives from 3M who came to the Museum to see it. "What we have, in a sense, is a plumbing system for light. This system will allow us to do maintenance on the light from accessible centralized locations," said Martin.

Other pipes are used to channel humidified air to fragile artifacts. This innovation was originally developed by Ralph Trimnel of Oak Park, Illinois, then further refined and adapted for artifact installations by Catherine "Cap" Sease, head of the Anthropology Department's Division of Conservation.

The design and accuracy of the Nile River marsh was helped along by the Museum's Botany Department. Birds in the marsh area were approved for accuracy by curators in the Bird Division; the real-looking scorpions there were cast from specimens the Museum's entomologists provided.

Unseen workers burn the incense and place the fresh-flower offerings at the Bastet shrine from time to time in order to enhance the reality of that exhibit. A sculptor has created the miniature dioramas that allow viewers to project themselves into seeing mummies made—or the gods deciding a human's fate in the afterlife (see p. 29). Artisans created "limestone" that blends so well with original pieces visitors may find it difficult to tell the new construction from the ancient. Painters have interpreted the marketplace and a life-sized diorama of the Nile River, with its brown desert/green marsh demarcation. Graphic designers have worked with a typeface that creates an identity for the exhibit, from the billboard-size "Inside Ancient Egypt" sign on Lake Shore Drive, north of the Museum, to the smallest sign beside an exhibit. Even those text blocks—"label copy," museum people call them—that describe each step of the exhibit were specially written in order that they might anticipate your questions and answer them, just as a knowledgeable friend would do.

For all its many facets, though, "Inside Ancient Egypt" is not yet complete. A part of its budget has yet to be spent. How that money will be used is not yet known. The reason is simple: The planners of this ambitious new exhibit will themselves be visiting "Inside Ancient Egypt." They will be looking and listening for comments of members and visitors that will let them know which parts of this exhibit hit the mark—and which ones may miss.

It is part of the Field Museum's commitment to make its treasures even more approachable and meaningful to Chicagoans and its many, varied visitors. "Inside Ancient Egypt" is the Museum's first large-scale exhibit that sets out to provide a broad overview of the history, the joys and concerns, the mystical practices and the mundane daily details of people in a specific place, using one of the Field Museum's magnificent collections as the starting point.

The way you see "Inside Ancient Egypt" the first time will very likely be different from the way you see it the second or the third time. And that, the Museum believes, is exactly as it ought to be.

Assistant developer Calvin Gray and exhibit designer Lisa McKernin inspect Bastet shrine. Ron Testa and Diane Alexander White 111064

ancient egypt 'firsts'

ARTS

Canon of Proportion. How human and animal figures are drawn.
Architecture. Design; quarrying of stone.
Carpentry & Woodworking. Veneering, fitting/joining of wood.
Writing. Papyrus and paper; hieroglyphs.
Crafts. Glaze work, glazing of stone, and glazed faience.

SCIENCES

Astronomy. Developed for timing religious festivals in temple and sighting the reappearance of the star Sirius, which signalled the start of inundation by the Nile.
Chemistry. Development of glazes, glassware.
Metalworking. Jewelry, casting of tools.
Navigation. Voyages on Red Sea to Punt (Somalia or Ethiopia).
Geometry. Calculating areas of fields, volume of pyramids.
Time Measurement. Solar calendar, later adopted by Julius Caesar; division of year into 12 months, with three seasons related to agricultural activity. Year, 365 days divided into 12 months, 30 days each, with 5 intercalary days.
Medicine. Diagnosis based on examination of the patient; surgery; natural drugs to treat specific maladies.

DAILY LIFE

Agriculture. Irrigation techniques.
Personal Products. Kohl eye makeup, oils, perfumes, wigs, mirrors.
Fabrics. Weaving flax into linen; special board for laundering clothes.
Sports. Wrestling, archery, boating.
Games. Dice, ring-around-the-rosy, Maypole dance, leapfrog, serpent game, senet game, possibly backgammon.

GOVERNMENT, SOCIAL and ECONOMIC SYSTEMS

Laws and Courts. Justice grounded in pharaoh's law and in pharaoh as custodian of Ma'at. Courts and trial procedures using evidence and testimony, witnesses, commissions of inquiry. Village and central (vizier's) courts.

Women's Role. Equality with men, grounded in pharaoh's law. Women could (and did) become pharaoh, function as scribes and administrators. Before and after marriage, women retained legal title to possess property and receive 1/3 share of property acquired jointly in marriage. Passed on property to chosen heirs. In daily life, women often functioned as shopkeepers, estate managers, and managed the household. In temples they served as priestesses, chantresses, and dancers. Isis was the goddess who protected and championed women and their rights.

Census-Taking. Cattle census attested in Ist Dynasty; taxation based on *increase* in the herd or on agricultural *harvest*, not on basic herd or on crop area planted.

Bureaucracy. Land and tax registration by central government. Archival records kept. Prison registers. Vizier's office supervised the bureaucracy.

Balance Scale and Measures. Included units for linear and weight measure, solid and liquid. Possibly originated metric and decimal systems (1 deben equals 10 kité).

Moving the Tomb

For Several Months, beginning November 23, 1987, Museum staff members Robin Faulkner and Catherine "Cap" Sease, together with a three-man crew from Belding Corporation, machinery-movers, worked daily to take apart, move, and reassemble the two chambers from Unis-ankh's tomb. During the 75-day project, the 122 huge limestone blocks comprising the tomb were moved from the ground floor to the first floor, into the new exhibit area. The task was completed on March 9, 1988.

Robin kept a daily record of the project (excerpts below). Nina shot more than 1,000 black-and-white negatives and several hundred color slides during the move; this documentation served as a reference in the reinstallation.

Nov. 23, 1987: Each block has been numbered, using the same numbers on the same blocks as in the move from the original site in Egypt nearly 80 years ago. Work begins with the top row of blocks. Each block is slid onto a padded forklift, then lowered to a wooden pallet. At day's end the accumulated blocks are transferred to a storage and conservation area.

Dec. 18, 1987: The move has gone smoothly; more than half the blocks are now in the conservation area, where they are being cleaned of several decades' dust and dirt.

Jan. 15, 1988: All the blocks except the false door have been removed from Hall J. The 1908 photographs taken at the excavation site in Egypt and the photo taken at Field Museum in the mid-'20s when the tomb was first installed show that the false door was the last block to be taken down and the first to be reinstalled. The photos confirm that our dismantling is on the right track. A gantry, installed by the false door, looks like two large tripods connected by a cross beam. Pulleys and chains attached to the cross beam are used to lay the block on its side so it can be more easily moved. We wonder if the false door will fit through a set of double doors as it proceeds to the freight elevator; to make the move more suspenseful, the elevator's capacity is 12,000 pounds—the estimated weight of the door.

Jan. 19, 1988: The width of the doorway is measured at 5'9", that of the false door 5'8". The pallet bearing the door is hooked to a forklift and pulled through the passageway with ½" clearance on each side. The freight elevator, with plenty of room to spare, easily lifts its load to the first floor.

The next step is formidable: Moving the false door across the marble floor of Stanley Field Hall into the new exhibit area without damage to the floor or to the 4,000-year-old door. To better distribute the door's six tons, modern moving techniques are abandoned in favor of that employed by the ancient Egyptians—using log rollers. Logs are laid in front of the false door, a chain is hooked to the forklift (in lieu of 70 ancient Egyptian workers), and the false door is pulled cautiously forward. Logs already passed over are picked up and placed continuously in front as the door rolls ahead. Gracefully, the precious cargo pulls into its new exhibit area—without a scratch.

March 9, 1988: The last block is in place. The crew makes a final inspection to make sure everything is in alignment. This afternoon we toast our success at an informal "capping off" ceremony. The Belding crew will go onto another job; we will start arriving at work at 8:30 in the morning, instead of at 7.

—Robin Faulkner, Design and Production Department; and Nina Cummings, Photography Department.

Offering chapel, view into antechamber, mastaba of Unis-ankh, limestone, Dynasty V. Cat. 24448. Photo by Ron Testa 111073

Mummification diorama (detail), created by exhibit preparator Jeff Wrona. Ron Testa and Diane Alexander White 111056

dioramas: a journey through the mind's eye

One of the most fascinating elements of "Inside Ancient Egypt" is the pair of miniaturized, remarkably detailed dioramas that are in the burial groups area. The smaller of the two illustrates four scenes in the afterlife rituals, conducted by the gods, as they were shown in a Book of the Dead from the Field Museum's collection of ancient Egyptian artifacts.

The larger of the two dioramas shows how the mummification process worked during the late New Kingdom period, when people other than just royalty and nobility were choosing to be mummified. It does this by presenting a workshop with indoor rooms and outdoor areas where embalmers could prepare each body for its reappearance in the afterworld; the final section is a solemn procession of the family of the deceased as they take his mummy, inside a coffin in his funeral boat.

The dioramas were created by Field Museum exhibit preparator Jeff Wrona. His work as a sculptor, with degrees from the School of the Art Institute of Chicago, had taught him about translating ideas and concepts into three-dimensional objects. Nothing, however, had prepared him for the incredibly tedious task—the mummification diorama alone took more than six months to construct—of adjusting every detail to a scale that works out to be 10 mm (approximately ⅜ of an inch) to 1 foot, or 33:1.

The 24 human figures measure close to 2½ inches tall, rather than the approximate 5½ feet that mummies indicate the average adult male stood in ancient Egypt. Facial expressions as well as positions and coverings allow each figure to emerge as an individual human, whether male, female, or child.

The hundreds of pieces in these settings that appear more than one time—canopic jars, bottles for oils, and mud bricks, for instance—were made following the casting processes Wrona learned in school. The difference, of course, was adjusting to size. For example, to make the coffins, which stand three inches tall, meant first carving the coffin from clay and then making tiny rubber molds. Into the molds Wrona poured polyester resin. After removing the hardened material, he painted each to achieve its uncanny detail.

On shelves and in niches in the walls are stacks of the white linen shrouds and bandages that were painstakingly wrapped around each body. Tiny baskets and other containers are arranged in ancient Egyptian style, as Egyptology consultant Frank Yurco suggested they could have been. The progression from the first scene to the funeral procession invites us to imagine ourselves watching these events in real life.

It is this ability of miniaturized dioramas—to create ideas in context—that makes them so valuable, suggests Michael Spock, the Field Museum's vice president for Public Programs. While there are also full-sized dioramas, Spock explains that "the miniature ones have a certain magical quality of taking you into the scene, an ability to allow the setting to speak directly to you."—*S.N.*

Kenya/Tanzania Safari
March 3-23, 1989

A FAMILY CHRISTMAS TEA AT FIELD MUSEUM

Please send me _____ adult tickets ($10 for members, $15 for nonmembers) and _____ children's tickets (age 13 and under, $5).

Total amount enclosed: $ _____

Please make checks payable to Field Museum and enclose a self-addressed, stamped envelope for your tickets, which will be mailed upon receipt of check. For further information call the Women's Board Office, 322-8870.

Send this form with your check to:

A FAMILY CHRISTMAS TEA
AT FIELD MUSEUM

Field Museum of Natural History
Women's Board Office
Roosevelt Road at Lake Shore Drive
Chicago, Illinois 60605-2496

Name _____

Street _____

City _____ State _____

Zip _____ Telephone _____

rengeti National Park. Game
lorongoro Conservation Area
eti.

nal Park. Full day exploring this

nal Park/Olduvai/Ngorongoro
uvai Gorge and the site of Louis
ey's discovery of *Zinjanthropus*
on to the spectacular Ngoron-

ater. Full day down in the crater,
otographing the animals.

ater/Lake Manyara National
Lake Manyara Hotel, set in love-
a swimming pool overlooking
al activities.

National Park. Morning and
drives, exploring the diversity

National Park/Namanga, Kenya/
ack to Arusha for lunch and
ne Namanga border, clear
turn to Nairobi.

re National Park/The Ark. This
oceed into deep forested area
of the finest game viewing in

for its big game and superb views of Mt. Kilimanjaro. Afternoon lecture by local researcher. Late afternoon game drive.

March 7
Amboseli National Park. Morning and afternoon game drives. Mid-day at leisure to relax at the lodge or swim in the pool.

March 8
Amboseli National Park/Namanga/Gibb's Farm, Tanzania. Cross the border, where we clear customs before proceeding into Tanzania to Gibb's Farm, where the remainder of day is at leisure.

Kenya. After lunch at Aberdare Country Club transfer to The Ark, "berthed" over a waterhole where the animals come to drink. From a ground-level lounge with large picture windows, you have an eye-to-eye view of this constantly changing scenario.

March 17
Aberdare National Park/Samburu Game Reserve. This reserve is home to several species found only in these northern areas.

March 18
Samburu Game Reserve. Your game viewing takes you through a variety of landscapes. Bird enthusiasts will be well rewarded with over 300 species, including the martial eagle, in this reserve.

March 19
Samburu Game Reserve/Mount Kenya Nanyuki. Drive to the famous Mt. Kenya Safari Club. The grounds cover 100 acres of blooming flower beds, ponds with water lilies and stands of shade trees—a litoral oasis in the middle of the African bush.

March 20
Mount Kenya Nanyuki/Nairobi/Masai Mara Game Reserve. Drive back to Nairobi and after lunch depart on the afternoon flight to the Masai Mara Game Reserve, where we'll stay in a luxury safari camp.

March 21
Masai Mara Game Reserve. Enjoy a day of game viewing in the Mara, one of the last strongholds of the great herds.

March 22
Masai Mara Game Reserve/Nairobi. After one last game run in the Mara, return to Nairobi by air. Remainder of day at leisure.

March 23
Nairobi/London/Chicago. Midnight flight to London on British Airways. Connect to British Airways to Chicago, arriving later the same day.

Antarctica

Discovering Antarctica, the Strait of Magellan, Tierra del Fuego, and Cape Horn aboard the *Illiria* under the leadership of Dr. Bruce D. Patterson, associate curator and head of the Division of Mammals at the Field Museum of Natural History.

February 20-March 7, 1989

Pre-Cruise Extension to Patagonia and the Lake District

February 15-23, 1989

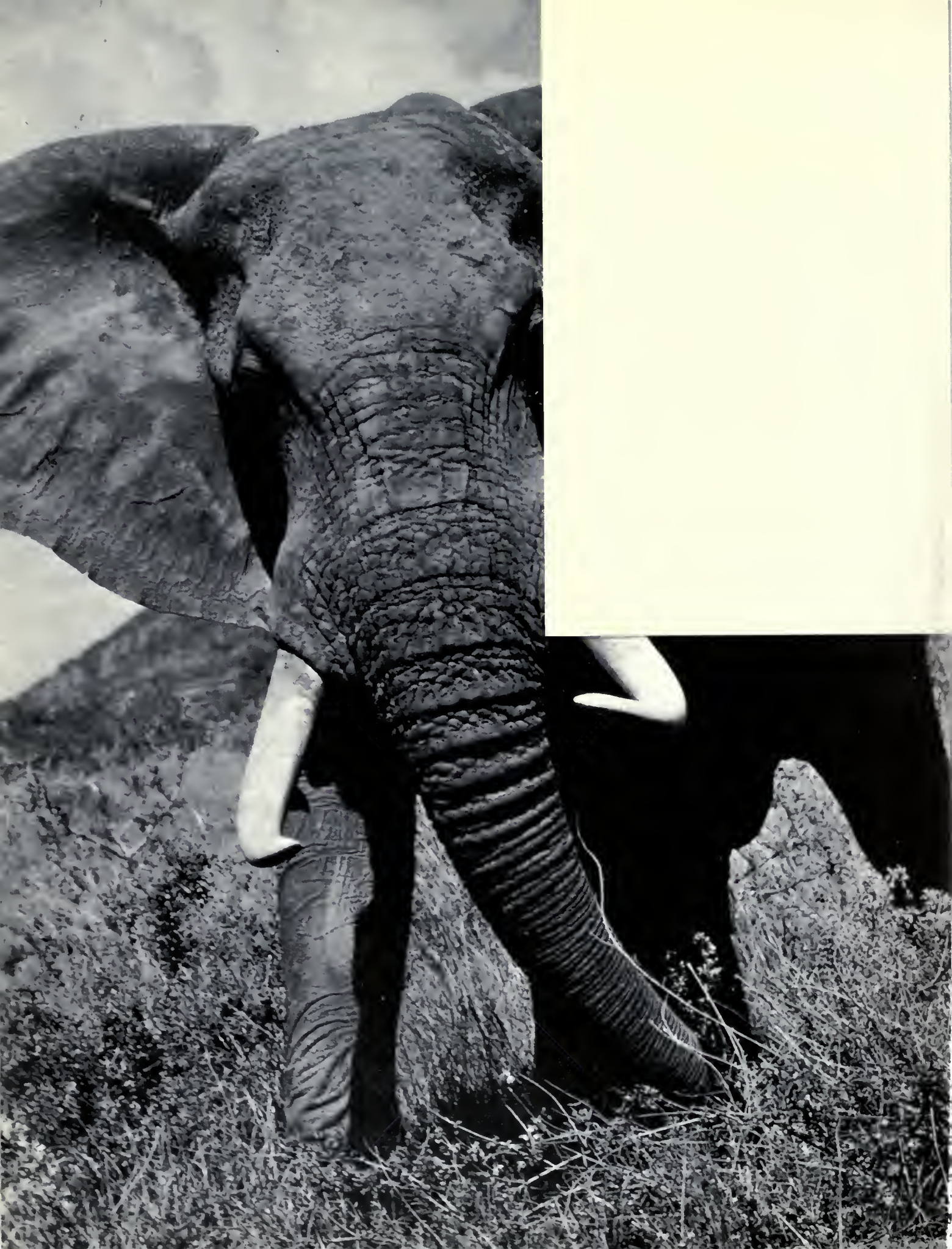
The Galapagos

Aboard the m. v. *Santa Cruz*
March 3-14, 1989
Optional Extension to Peru March 14-20
Price: $3,550-$3,840

March 3: Chicago/Miami/Quito. Welcome party and orientation.
March 4: A full day excursion to the colorful Indian fair of Otavalo.
March 5: All-day birding excursion up into the mountains outside Quito.
March 6: Fly to Guayaquil and on to Baltra where we board the *Santa Cruz*.
March 7: Cruising—Bartolome and Tower Islands.
March 8: Cruising—Isabela and Fernandina Islands.
March 9: Cruising—North Seymour Island.
March 10: Cruising—Hood and Floreana Islands.
March 11: Cruising—Santa Cruz and Plaza Islands.
March 12: Cruising—James Island.
March 13: This morning we cruise to Baltra, disembarking to board our flight to Guayaquil. Farewell dinner.
March 14: Return flight to Chicago.

Join us as we explore one of the world's greatest living laboratories of natural history under the leadership of Dr. David E. Willard, collection manager of the Bird Division of the Field Museum of Natural History. The Galapagos Islands—birthplace of Darwin's "Origin of Species"—situated 600 miles off the coast of Ecuador, remain remote and out of the elements of nature where an abundance of strange creatures known nowhere else on earth reside. An optional trip to Peru at a cost of $1,450 includes visits to the world-famous site of Machu Picchu, Lima, and Cuzco.

For reservations, call or write Dorothy Roder (322-8862), Tours Manager, Field Museum, Roosevelt Rd. at Lake Shore Dr., Chicago, Il 60605



FIELD MUSEUM TOURS

Kenya/Tanzania Safari

March 3-23, 1989

Leader: Audrey Joy Faden

Price: $6,350

ITINERARY

March 3
Fly from Chicago to London via British Airways.

March 4
Fly from London to Nairobi, Kenya. Day rooms in London. Evening flight to Nairobi.

March 5
Nairobi. City tour. Welcome cocktail party and dinner.

March 6
Nairobi/Amboseli National Park, justly famous for its big game and superb views of Mt. Kilimanjaro. Afternoon lecture by local researcher. Late afternoon game drive.

March 7
Amboseli National Park. Morning and afternoon game drives. Mid-day at leisure to relax at the lodge or swim in the pool.

March 8
Amboseli National Park/Namanga/Gibb's Farm, Tanzania. Cross the border, where we clear customs before proceeding into Tanzania to Gibb's Farm, where the remainder of day is at leisure.

March 9
Gibb's Farm/Serengeti National Park. Game drives in the Ngorongoro Conservation Area and the Serengeti.

March 10
Serengeti National Park. Full day exploring this vast area.

March 11
Serengeti National Park/Olduvai/Ngorongoro Crater. Visit Olduvai Gorge and the site of Louis and Mary Leakey's discovery of *Zinjanthropus bosei*. Continue on to the spectacular Ngorongoro Crater.

March 12
Ngorongoro Crater. Full day down in the crater, tracking and photographing the animals.

March 13
Ngorongoro Crater/Lake Manyara National Park. Depart to Lake Manyara Hotel, set in lovely gardens with a swimming pool overlooking the park. Optional activities.

March 14
Lake Manyara National Park. Morning and afternoon game drives, exploring the diversity of this park.

March 15
Lake Manyara National Park/Namanga, Kenya/Nairobi. Drive back to Arusha for lunch and continue on to the Namanga border, clear customs and return to Nairobi.

March 16
Nairobi/Aberdare National Park/The Ark. This morning you proceed into deep forested area alive with some of the finest game viewing in Kenya. After lunch at Aberdare Country Club transfer to The Ark, "berthed" over a waterhole where the animals come to drink. From a ground-level lounge with large picture windows, you have an eye-to-eye view of this constantly changing scenario.

March 17
Aberdare National Park/Samburu Game Reserve. This reserve is home to several species found only in these northern areas.

March 18
Samburu Game Reserve. Your game viewing takes you through a variety of landscapes. Bird enthusiasts will be well rewarded with over 300 species, including the martial eagle, in this reserve.

March 19
Samburu Game Reserve/Mount Kenya Nanyuki. Drive to the famous Mt. Kenya Safari Club. The grounds cover 100 acres of blooming flower beds, ponds with water lilies and stands of shade trees—a litoral oasis in the middle of the African bush.

March 20
Mount Kenya Nanyuki/Nairobi/Masai Mara Game Reserve. Drive back to Nairobi and after lunch depart on the afternoon flight to the Masai Mara Game Reserve, where we'll stay in a luxury safari camp.

March 21
Masai Mara Game Reserve. Enjoy a day of game viewing in the Mara, one of the last strongholds of the great herds.

March 22
Masai Mara Game Reserve/Nairobi. After one last game run in the Mara, return to Nairobi by air. Remainder of day at leisure.

March 23
Nairobi/London/Chicago. Midnight flight to London on British Airways. Connect to British Airways to Chicago, arriving later the same day.

Antarctica

Discovering Antarctica, the Strait of Magellan, Tierra del Fuego, and Cape Horn aboard the *Illiria* under the leadership of Dr. Bruce D. Patterson, associate curator and head of the Division of Mammals at the Field Museum of Natural History.

February 20-March 7, 1989

Pre-Cruise Extension to Patagonia and the Lake District

February 15-23, 1989

The Galapagos

Aboard the m. v. *Santa Cruz*

March 3-14, 1989

Optional Extension to Peru March 14-20

Price: $3,550-$3,840

March 3: Chicago/Miami/Quito. Welcome party and orientation.
March 4: A full day excursion to the colorful Indian fair of Otavalo.
March 5: All-day birding excursion up into the mountains outside Quito.
March 6: Fly to Guayaquil and on to Baltra where we board the *Santa Cruz*.
March 7: Cruising—Bartolome and Tower Islands.
March 8: Cruising—Isabela and Fernandina Islands.
March 9: Cruising—North Seymour Island.
March 10: Cruising—Hood and Floreana Islands.
March 11: Cruising—Santa Cruz and Plaza Islands.
March 12: Cruising—James Island.
March 13: This morning we cruise to Baltra, disembarking to board our flight to Guayaquil. Farewell dinner.
March 14: Return flight to Chicago.

Join us as we explore one of the world's greatest living laboratories of natural history under the leadership of Dr. David E. Willard, collection manager of the Bird Division of the Field Museum of Natural History. The Galapagos Islands—birthplace of Darwin's "Origin of Species"—situated 600 miles off the coast of Ecuador, remain remote and out of the elements of nature where an abundance of strange creatures known nowhere else on earth reside. An optional trip to Peru at a cost of $1,450 includes visits to the world-famous site of Machu Picchu, Lima, and Cuzco.

For reservations, call or write Dorothy Roder (322-8862), Tours Manager, Field Museum, Roosevelt Rd. at Lake Shore Dr., Chicago, Il 60605

Field Museum of Natural History
Membership Department
Roosevelt Road at Lake Shore Drive
Chicago, IL 60605-2499

DR RONALD H P
1221 62ND ST
DOWNERS GROVE IL 6

FIELD MUSEUM OF NATURAL HISTORY BULLETIN

December 1988

1989 Calendar

Field Museum of Natural History Bulletin

Published since 1930 by
Field Museum of Natural History
Founded 1893

Editor: David M. Walsten
Production Liaison: Pamela Stearns
Staff Photographer: Ron Testa

BOARD OF TRUSTEES

Robert A. Pritzker
Chairman
Mrs. T. Stanton Armour
George R. Baker
Robert O. Bass
Gordon Bent
Mrs. Philip D. Block III
Willard L. Boyd,
President
Robert D. Cadieux
Worley H. Clark
James W. Compton
Frank W. Considine
William R. Dickinson, Jr.
Thomas E. Donnelley II
Thomas J. Eyerman
Marshall Field
Ronald J. Gidwitz
Clarence E. Johnson
Richard M. Jones
John James Kinsella
Robert D. Kolar
Hugo J. Melvoin
Leo. F. Mullin
James J. O'Connor
Mrs. James J. O'Connor
James H. Ransom
John S. Runnells
Patrick G. Ryan
William L. Searle
Robert H. Strotz
Mrs. Theodore D. Tieken
E. Leland Webber
Blaine J. Yarrington

LIFE TRUSTEES

Harry O. Bercher
Bowen Blair
Stanton R. Cook
Mrs. Edwin J. DeCosta
Mrs. David W. Grainger
Clifford C. Gregg
Mrs. Robert S. Hartman
Edward Byron Smith
John W. Sullivan

Ownership Management and Circulation

Filing date: Sept. 26, 1988. Title: *Field Museum of Natural History Bulletin.* Publication no. 898940. Frequency of publication: Monthly except for combined July/August issue. Number of issues published annually: 11. Annual subscription price: $6.00. Office: Roosevelt Rd. at Lake Shore Dr., Chicago, IL 60605.

Publisher: Field Museum of Natural History, Roosevelt Rd., at Lake Shore Dr., Chicago, IL 60605. Editor: David M. Walsten, Field Museum of Natural History, Roosevelt Rd. at Lake Shore Dr., Chicago, IL 60605. Owner: Field Museum of Natural History, Roosevelt Rd. at Lake Shore Dr., Chicago, IL 60605. Known bondholders, mortgagees, and other security holders: none. The purpose, function, and nonprofit status of this organization and the exempt status for Federal income tax purposes has not changed during the preceding 12 months.

	Average number of copies each issue preceding 12 months	*Actual number of copies single issue nearest to filing date*
Total copies printed	27,200	27,500
Paid circulation (sales through dealers, vendors, carriers)	none	none
Paid circulation (mail subscriptions)	24,088	25,366
Total paid circulation	24,088	25,366
Free distribution	614	616
Total distribution	24,702	25,982
Office use, left over	2,498	1,518
Return from news agent	none	none
Total	27,200	27,500

I certify that the statements made by me above are correct and complete. *Jimmie W. Craft,* vice president for Finance and Museum Services.

CONTENTS

December 1988
Volume 59, Number 11

Calendar for 1989, featuring artifacts from the newly opened exhibit "Inside Ancient Egypt." Photos by Ron Testa and Diane Alexander White.

COVER

Bronze cat from Egypt, probably Saqqara; Late Period, *ca.* 600 B.C. One of the finest Egyptian cats in existence. Acquired by Edward E. Ayer in 1895 and given to Field Museum by Watson F. Blair. Cat. 30286. Behind the cat is the false door from the tomb of Unis-ankh, also in the Field Museum's collection. Photo by Ron Testa and Diane Alexander White. 109936.

Typography by Tele/Typography

VOLUNTEER AT FIELD MUSEUM

Learn something new or share your expertise—a wide variety of challenging and rewarding volunteer opportunities for either weekdays or weekends are currently available. Please call the Volunteer Coordinator at (312) 922-9410, extension 360, for more information.

Field Museum of Natural History Bulletin (USPS 898-940) is published monthly, except combined July/August issue, by Field Museum of Natural History, Roosevelt Road at Lake Shore Drive, Chicago, IL 60605-2496.

Copyright ©1988 Field Museum of Natural History.

Subscriptions: $6.00 annually. $3.00 for schools. Museum membership includes *Bulletin* subscription. Opinions expressed by authors are their own and do not necessarily reflect the policy of Field Museum. Unsolicited manuscripts are welcome. Museum phone: (312) 922-9410. Notification of address change should include address label and be sent to Membership Department. Postmaster: Please send form 3579 to Field Museum of Natural History, Roosevelt Road at Lake Shore Drive, Chicago, IL 60605-2496. ISSN: 0015-0703.

Index to Field Museum of Natural History Bulletin, Volume 59 (1988)

Articles

A.B. Lewis Collection from Melanesia, The: 75 Years Later, by Robert L. Welsch: Sept. 10
Beginning as a Collector, by A. S. Meek: J/A 19
Behind the Scenes: The Unseen Side of "Inside Ancient Egypt," by Susan Nelson: Nov. 23
Birds in Art at Field Museum, by John W. Fitzpatrick: March 7
Celebration of Philip Hershkovitz, A by Bruce D. Patterson: Jan. 24
Chinese Pewter Teapots and Tea Wares, by Ho Chuimei and Bennet Bronson: March 9
Costa Rica, Tropical Biology, and a Visit with Otón Jiménez, by William C. Burger: May 20
Dioramas: A Journey through the Mind's Eye, by Susan Nelson: Nov. 29
Distilling the Truth about Ethanol, by Larry Dombrowski: Sept. 29
Egyptian Collection, The, and the Legacy of Edward E. Ayer, by Frank J. Yurco: Nov 20
Exhibition Conservation, by Catherine Sease: Feb. 5
From Bushman to Tut—Exhibit Blockbusters of the Past, by Alan Solem and W. Peyton Fawcett; May 25
Gensburg-Markham, by Jerry Sullivan: J/A 22
Gnetales, The, by Peter R. Crane: March 21
Hoatzins at Home, by William Beebe: May 15
Hyde Park's Parakeets, by David M. Walsten: April 23
John A. Kakaruk: Painter of Inland Eskimo Life, by James W. VanStone: Feb. 14
Life and Times of the Dinosaurs, by Dale A. Russell: Oct. 8
Mountains in the Sea, Mountains in the Sky, by Valerie Searle Lewis and Louise K. Smith: J/A 8
Moving the Tomb, by Robin Faulkner and Nina Cummings: Nov. 28
New Britain Notebook, by A.B. Lewis: Sept. 16
On the Trail of Erik the Red in Iceland, by Wendell H. Oswalt: Sept. 6
Paradise Being Lost, by John W. Fitzpatrick: Jan. 10
Studies in Neotropical Mammalogy: Jan. 30
Teach the Mind, Touch the Spirit, by Carolyn Blackmon: May 6
Traditional Silk Sarongs, by Robert L. Welsch: April 13
Traditions in Japanese Art: The Boone Collection, by Suzanne Arata and Caroline Moore: June 6
Twenty Years of Volunteers, by Ellen Zebrun: June 27
Unearthing Ancient Amphibians, by Robert McKay: Jan. 6
Welcome to Ancient Egypt, by Susan Nelson: Nov. 6
Welwitschia the Wonderful, by Peter R. Crane: Feb. 22

Authors

Arata, Suzanne (co-author): *Traditions in Japanese Art: The Boone Collection:* June 6
Beebe, William: *Hoatzins at Home:* May 15
Blackmon, Carolyn: *Teach the Mind, Touch the Spirit:* May 6
Bronson, Bennet (co-author): *Chinese Pewter Teapots and Tea Wares:* March 9
Burger, William C.: *Costa Rica, Tropical Biology, and a Visit with Otón Jiménez:* May 20
Chuimei, Ho (co-author): *Chinese Pewter Teapots and Tea Wares:* March 9
Crane, Peter R.: *The Gnetales:* March 21
———— : *Welwitschia the Wonderful:* Feb. 22
Cummings, Nina (co-author): *Moving the Tomb:* Nov. 28
Dombrowski, Larry: *Distilling the Truth about Ethanol:* Sept. 29
Fawcett, W. Peyton (co-author): *From Bushman to Tut—Exhibit Blockbusters of the Past:* May 25
Faulkner, Robin (co-author): *Moving the Tomb:* Nov. 28
Fitzpatrick, John W.: *Birds in Art at Field Museum:* March 7
———— : *Paradise Being Lost:* Jan. 10
Lewis, A.B.: *New Britain Notebook:* Sept. 16
Lewis, Valerie Searle (co-author): *Mountains in the Sea, Mountains in the Sky:* J/A 8
McKay, Robert: *Unearthing Ancient Amphibians:* Jan. 6
Meek, A.S.: *Beginning as a Collector:* J/A 19
Moore, Caroline (co-author): *Traditions in Japanese Art: The Boone Collection:* June 6
Nelson, Susan: *Behind the Scenes: The Unseen Side of "Inside Ancient Egypt":* Nov. 23
———— : *Dioramas: A Journey through the Mind's Eye:* Nov. 29
———— : *Welcome to Ancient Egypt:* Nov. 6
Oswalt, Wendell H.: *On the Trail of Erik the Red in Iceland:* Sept. 6
Patterson, Bruce D.: *A Celebration of Philip Hershkovitz:* Jan. 24
Russell, Dale A.: *Life and Times of the Dinosaurs:* Oct. 8
Sease, Catherine: *Exhibition Conservation:* Feb. 5
Solem, Alan (co-author): *From Bushman to Tut—Exhibit Blockbusters of the Past:* May 25
Smith, Louise K. (co-author): *Mountains in the Sea, Mountains in the Sky:* J/A 8
Sullivan, Jerry: *Gensburg-Markham:* J/A 22
VanStone, James W.: *John A. Kakaruk: Painter of Inland Eskimo Life:* Feb. 14
Walsten, David M.: *Hyde Park's Parakeets:* April 23
Welsch, Robert L.: *The A.B. Lewis Collection from Melanesia: 75 Years Later:* Sept. 10
———— : *Traditional Silk Sarongs:* April 13
Yurco, Frank J.: *The Egyptian Collection and the Legacy of Edward E. Ayer:* Nov. 20
Zebrun, Ellen: *Twenty Years of Volunteers:* June 27

Limestone head of a nobleman, probably General Nakht-Min, who served King Tut-ankh-Amun. Late Dynasty XVIII (1335-1325 B.C.).
Cat. 31719.
Ron Testa 110715

January 1989

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1 *New Year's Day*	2	3	4	5	6	7
8	9	10	11	12	13	14
15 *Martin Luther King Jr.'s Birthday*	16 *Martin Luther King Jr.'s Birthday Observed*	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31			December 1988 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	February 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28

Bronze votive statuettes. *Left:* Isis with infant Horus; cat. 30294; *right:* Ptah, Lord of Memphis, cat. 30299. Dynasty XXVI-Ptolemaic (556-30 B.C.).

Ron Testa 110650

February 1989

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
January 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	March 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31		1	2	3	4
5	6	7	8	9	10	11
12 *Lincoln's Birthday*	13	14 *St. Valentine's Day*	15	16	17	18
19	20 *President's Day*	21	22 *Washington's Birthday*	23	24	25
26	27	28				

Top to bottom: Winged scarab of glazed pottery, Dynasty XXVI, cat. 31175; amulet of glazed pottery, unknown period, cat. 31154;

March 1989

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
February 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28	April 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30		1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17 *St. Patrick's Day*	18
19	20	21	22	23	24 *Good Friday*	25
26 *Easter*	27	28	29	30	31	

Basalt head of unknown man. Early Roman period (50-100 A.D.). Cat. 105182.
Ron Testa 105182

April 1989

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
March 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	May 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31					1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20 *Passover*	21	22
23 30	24	25	26	27	28	29

Painted wood model of funerary boat bearing mummy of the deceased. Middle Kingdom, Dynasty IX-XI (2150-1991 B.C.). Cat. 30100.
Ron Testa and Diane Alexander White 110665

May 1989

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1	2	3	4	5	6
7	8	9	10	11	12	13
14 *Mother's Day*	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29 *Memorial Day*	30	31			

April

						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

June

				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

Faience ushabtis of Admiral Heka-em-sa-ef. Dynasty XXVI (589-570 B.C.). Cat. 111252, 24416:1, 2, 3
Diane Alexander White 110683

June 1989

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
May 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	July 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31			1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18 *Father's Day*	19	20	21	22	23	24
25	26	27	28	29	30	

Alabaster and glass vases. Old Kingdom (2730-2250 B.C.). Ptolemaic period (332-30 B.C.).
Ron Testa 110716

July 1989

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
June 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	August 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31					1
2	3	4 *Independence Day*	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23 30	24 31	25	26	27	28	29

Bronze statue of Osiris, King of the Afterlife and Lord of All. Dynasty XXVI (589-570 B.C.). Cat. 30297.
Diane Alexander White 110651

August 1989

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
July 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	September 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

Coffin and mummies of the children of Myron, probably a Greek settler. They are bandaged with linen and have gilded cartonnage masks. Ptolemaic period. (332-30 B.C.). Cat. 30019.

September 1989

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
August 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	October 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31				1	2
3	4 *Labor Day*	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30 *Rosh Hashanah*

Left: coffin and mummy of Chenet-aa, probably a lady of the middle class. Dynasty XXII. Cat. 30005. *Right:* coffin of doorkeeper of the Temple of Amun at Thebes. Dynasty XXI-XXII. (985-800 B.C.). Cat. 30014

Ron Testa and Diane Alexander White 110727

October 1989

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	2	3	4	5	6	7
8	9 *Yom Kippur* *Columbus Day*	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31 *Halloween*				

September

					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

November

			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

Left and right: alabaster canopic jars of Hor-udja. Dynasty XXVI. Cats. 30535 B, A. *Center:* New Year's flask of greenish glazed faience. Dynasty XXVI. Cat. 31011. *Right:* Bronze cat and two kittens, votive for Bastet. Dynasty XXVI-Ptolemaic period (556-30 B.C.). Cat. 30285.

Diane Alexander White 110366

November 1989

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
October 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	December 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31		1	2	3	4
5	6	7	8	9	10	11 *Veterans Day*
12	13	14	15	16	17	18
19	20	21	22	23 *Thanksgiving*	24	25
26	27	28	29	30		

Black granite statue of Senmut holding Princess Neferu-Re. Dynasty XVIII (1504-1482 B.C.). Cat. 173800.
Ron Testa 110625

December 1989

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
November 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	January 1990 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31				1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23 *Hanukah*
24 31	25 *Christmas*	26	27	28	29	30

Field Museum of Natural History
Membership Department
Roosevelt Road at Lake Shore Drive
Chicago, IL 60605-2499